ENVIRONMENTAL STEWARDSHIP PLAN
FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE
U.S. Border Patrol Del Rio Sector, Texas

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol

July 2008

COVER SHEET

ENVIRONMENTAL STEWARDSHIP PLAN FOR THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE U.S. BORDER PATROL DEL RIO SECTOR, TEXAS

Responsible Agencies: U.S. Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), U.S. Border Patrol (USBP).

Coordinating Agencies: U.S. Army Corps of Engineers (USACE) Fort Worth District, the United States Section of the International Boundary and Water Commission (USIBWC), and U.S. Fish and Wildlife Service (USFWS).

Affected Location: U.S./Mexico international border in Val Verde and Maverick counties, Texas.

Project Description: The Project includes the construction, operation, and maintenance of tactical infrastructure, to include primary pedestrian fencing, concrete retaining walls, access and patrol roads, and lights along approximately 4 miles of the U.S./Mexico international border within the USBP Del Rio Sector, Texas. The Project will be implemented in two discrete sections, approximately 3 miles and 1 mile in length, respectively. The section in Maverick County will connect to a previously evaluated primary pedestrian fence section.

Report Designation: Environmental Stewardship Plan (ESP).

Abstract: CBP plans to construct, operate, and maintain approximately 4 miles of tactical infrastructure, including two discrete sections of primary pedestrian fence, concrete retaining walls, lights, and access and patrol roads, along the U.S./Mexico international border in Val Verde and Maverick counties, Texas. Individual sections will be approximately 3 miles and 1 mile in length. The tactical infrastructure will encroach on parcels of privately and publicly owned land.

This ESP analyzes and documents environmental consequences associated with the Project.

The public may obtain additional copies of the ESP from the Project Web site at *www.BorderFencePlanning.com*; by emailing *information@BorderFencePlanning.com*; or by written request to Mr. Loren Flossman, Program Manager, Secure Border Initiative (SBI) Tactical Infrastructure, 1300 Pennsylvania Ave, NW, Suite 7.2C, Washington, DC 20229, Tel: (877) 752-0420, Fax: (703) 752-7754.

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EXECUTIVE SUMMARY

Background

On April 1, 2008, the Secretary of the U.S. Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996, as amended, exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico international border. The tactical infrastructure described in this Environmental Stewardship Plan (ESP) is covered by the Secretary's April 1, 2008, waiver (see **Appendix A**). Although the Secretary's waiver means that U.S Customs and Border Protection (CBP) no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to continue to protect valuable natural and cultural resources. CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction, operation, and maintenance of tactical infrastructure in the USBP's Del Rio Sector. The ESP also discusses CBP's plans as to how it can mitigate potential environmental impacts. The ESP will guide CBP's efforts going forward.

As it moves forward with the project described in this ESP, CBP will continue to work in a collaborative manner with local governments, state and Federal land managers, and the interested public to identify environmentally sensitive resources and develop appropriate best management practices (BMPs) to avoid or minimize adverse impacts resulting from the installation of tactical infrastructure.

Goals and Objectives of the Project

The Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. borders between ports of entry (POEs) in the USBP Del Rio Sector. The Project will help to deter illegal entries within the USBP Del Rio Sector by improving enforcement efficiency, thus preventing terrorists and terrorist weapons, illegal aliens, drugs, and other cross border violators and contraband from entering the United States, while providing a safer work environment for USBP agents. The USBP Del Rio Sector has identified two discrete areas along the border that experience high levels of illegal entry. Illegal cross-border activity typically occurs in areas that are remote and not easily accessed by USBP agents, near POEs where concentrated populations might live on either side of the border, or in locations that have quick access to U.S. transportation routes.

The Project is being carried out pursuant to Section 102 of IIRIRA, 8 United States Code (U.S.C.) § 1103 note. In Section 102(b) of IIRIRA, Congress called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border. This total includes certain priority miles of fencing that are to be completed by December of 2008. Section 102(b) further specifies that these priority miles are to be constructed in areas where it would be practical and effective in deterring smugglers and aliens attempting to gain illegal entry into the United States.

Public Outreach and Coordination

CBP notified relevant Federal, state, and local agencies of the Project and requested input on environmental concerns that such parties might have regarding the Project. CBP has coordinated with the U.S. Environmental Protection Agency (USEPA); U.S. Fish and Wildlife Service (USFWS); State Historic Preservation Office (SHPO); and other Federal, state, and local agencies.

A Draft Environmental Assessment (EA) was prepared, copies were mailed to interested parties, it was posted on a public Web site, and a 30-day public review and comment period was announced. A public open house was advertised and held at the City of Del Rio Civic Center in Del Rio, Texas, on January 24, 2008. The open house was attended by 30 people. Although the Secretary issued the waiver, CBP has continued to work in a collaborative manner with agencies and has considered and incorporated agency and public comments into this ESP. CBP responses to public comments on the Draft EA will also be provided on the *www.BorderFencePlanning.com* Web site. Analyses from the Draft EA have been used to develop this ESP.

Description of the Project

CBP plans to construct, operate, and maintain tactical infrastructure consisting of two discrete sections of primary pedestrian fencing, concrete retaining walls, patrol and access roads, and lights along the U.S./Mexico international border in the USBP Del Rio Sector, Texas. This Project also includes the removal and management of an invasive giant reed species (*Arundo donax*) to improve line of sight for USBP agents in Section M-1. The section in Maverick County will connect to a previously evaluated and approved primary pedestrian fence. The locations of tactical infrastructure are based on a USBP Del Rio Sector assessment of local operational requirements where such infrastructure will assist USBP agents in reducing illegal cross-border activities.

Environmental Impacts, Mitigation, and Best Management Practices

Table ES-1 provides an overview of potential environmental impacts by specific resource areas. **Chapters 2** through **11** of this ESP address these impacts in more detail.

CBP followed specially developed design criteria to reduce adverse environmental impacts and will implement mitigation measures to further reduce or offset adverse environmental impacts without compromising operational requirements. Design criteria to reduce adverse environmental impacts include selecting a location for tactical infrastructure that will avoid or minimize impacts on environmental and cultural resources, consulting with Federal and state agencies and other stakeholders to avoid or minimize adverse environmental impacts and develop appropriate BMPs, and avoiding physical disturbance and construction of solid barriers in wetlands/riparian areas and streambeds, where practicable. BMPs will include implementation of a Construction Mitigation and Restoration Plan, Spill Prevention Control and Countermeasure Plan, Storm Water Pollution Prevention Plan, Environmental Protection Plans, Dust Control Plan, Fire Prevention and Suppression Plan, and Unanticipated Discovery Plan.

CBP will enter into a programmatic mitigation agreement with the Department of the Interior (DOI) and fund a mitigation pool for adverse impacts that cannot be avoided.

Table ES-1. Summary of Environmental Impacts, Mitigation, and BMPs

Resource Area	Impacts of the Project	BMPs/Mitigation
Air Quality	Emissions will result in short-term minor adverse effects.	BMPs to reduce dust and control PM_{10} emissions. Construction equipment will be kept in good operating condition to minimize exhaust Construction speed limits will not exceed 35 miles per hour.
Noise	Noise from construction equipment and increased traffic will result in short-term moderate and long-term negligible adverse effects.	Mufflers and properly working construction equipment will be used to reduce noise. Generators will have baffle boxes, mufflers, or other noise abatement capabilities. Blasting mats will be used to minimize noise and debris.

Resource Area	Impacts of the Project	BMPs/Mitigation
Land Use and Visual Resources	Land use changes and incompatibilities will result in short- and long-term minor adverse effects.	None required.
Geology and Soils	Grading, contouring, and trenching will result in short- and long-term minor to moderate adverse effects.	Construction related vehicles will remain on established roads while areas with highly erodible soils will be avoided when possible. Gravel or topsoil will be obtained from developed or previously used sources.
Water Use and Quality	Grading and contouring will result in short-term minor adverse effects.	Construction activities will stop during heavy rains. All fuels, oils, and solvents will be collected and stored. Where practicable alternatives exist, stream crossings will not be located at bends to protect channel stability. Equipment maintenance, staging, laydown, or fuel dispensing will occur upland to prevent runoff. Fence types will allow conveyance of water.

Resource Area	Impacts of the Project	BMPs/Mitigation
Biological Resources		
Vegetation	Disturbance and clearing will result in short- and long-term minor to moderate adverse effects.	Construction equipment will be cleaned to minimize spread of non-native species. Removal of brush in Federally protected areas will be limited to smallest amount possible. Invasive plants that appear on project area will be removed. Fill material, if required, will be weed-free to the maximum extent practicable.
Wildlife and Aquatic Species	Disturbance and clearing will result in short- and long-term minor to moderate adverse effects.	To prevent entrapment of wildlife all excavated holes or trenches will either be covered or provided with wildlife escape ramps. All poles and posts will be covered to prevent entrapment and discourage roosting.

Resource Area	Impacts of the Project	BMPs/Mitigation
Special Status Species	Disturbance and clearing will result in short- and long-term minor to moderate adverse effects.	Environmental monitor onsite during construction to account for occurrences of special status species. If Federally protected species is encountered, monitor can recommend the temporary suspension of construction activities to the construction manager. Fence types will allow transboundary migration of small animals. Ground disturbance during migratory bird nesting season will require migratory bird nest survey and possible removal and relocation. Small openings will be integrated into bollard type fence design to allow for passage of small animals. Specific BMPs for endangered species are outlined in the Biological Resource Plan in **Appendix G**.
Cultural Resources	Long-term minor adverse effects will be expected.	Excavation activities will be monitored for cultural resources. Any discoveries will halt construction and be coordinated with the SHPO.
Socioeconomic Resources	Short- and long-term minor beneficial effects on the local economy and safety, respectively, will be expected, and potential minor adverse effects on low-income or minority populations will be expected.	None required.

Resource Area	Impacts of the Project	BMPs/Mitigation
Utilities and Infrastructure	No new effects on storm water management, or electrical or natural gas systems. Short-term minor adverse effects on municipal water, sanitary sewer systems, and solid waste management.	None required

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1. GENERAL PROJECT DESCRIPTION

1.1 INTRODUCTION TO THE ENVIRONMENTAL STEWARDSHIP PLAN

On April 1, 2008, the Secretary of the U.S. Department of Homeland Security (DHS), pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure expeditious construction of tactical infrastructure along the U.S./Mexico international border. The tactical infrastructure described in this Environmental Stewardship Plan (ESP) is covered by the Secretary's April 1, 2008, waiver (73 Federal Register [FR] 65, pp. 18293–24, **Appendix A**). Although the Secretary's waiver means that U.S. Customs and Border Protection (CBP) no longer has any specific legal obligations under the laws that are included in the waiver, the Secretary committed DHS to continue to protect valuable natural and cultural resources.

CBP strongly supports the Secretary's commitment to responsible environmental stewardship. To that end, CBP has prepared this ESP, which analyzes the potential environmental impacts associated with construction of tactical infrastructure in the USBP's Del Rio Sector. The ESP also discusses CBP's plans as to how it can mitigate potential environmental impacts. The ESP will guide CBP's efforts going forward.

As it moves forward with the project described in this ESP, CBP will continue to work in a collaborative manner with local governments, state and Federal land managers, and the interested public to identify environmentally sensitive resources and develop appropriate best management practices (BMPs) to avoid or minimize adverse impacts resulting from the installation of tactical infrastructure.

This ESP is divided into 13 chapters plus appendices. The first chapter presents a detailed description of the Project. Subsequent chapters present information on the resources present and evaluate the direct, indirect, and cumulative effects of the Project. The ESP also describes measures CBP has identified—in consultation with Federal, state, and local agencies—to avoid, minimize, or mitigate impacts on the environment, whenever possible. The following resource areas are presented in this ESP: air quality, noise, land use and visual resources, geological resources and soils, water use and quality, biological resources (i.e., vegetation, wildlife and aquatic species, special status species), cultural resources, socioeconomic resources, and utilities and infrastructure. Some environmental resources were not included in this ESP because they were not relevant to the analysis. These potential resource areas include roadways and traffic (omitted because the Project will not be accessible from public roadways), sustainability (omitted because the Project will use minimal amounts of resources during construction and maintenance), and human health and safety (omitted because construction workers will be subject to Occupational Safety and Health

Administration [OSHA] standards and the Project will not introduce new or unusual safety risks).

Appendix A presents the Secretary's published waiver pursuant to IIRIRA. **Appendix B** provides information on primary pedestrian and vehicle fence designs. **Appendix C** provides air quality emissions calculations. **Appendix D** presents detailed maps of fence sections, **Appendix D** presents detailed soils maps, **Appendix E** presents the Biological Survey Report., and **Appendix F** presents the Biological Resources Plan.

CBP will follow specially developed design criteria to reduce adverse environmental impacts and will implement mitigation measures to further reduce or offset adverse environmental impacts to the extent possible. Design criteria to reduce adverse environmental impacts include avoiding physical disturbance and construction of solid barriers in wetlands/riparian areas and streambeds, where practicable. Consulting with Federal and state agencies and other stakeholders will augment efforts to avoid or minimize adverse environmental impacts. Developing appropriate BMPs to protect natural and cultural resources will be utilized to the extent possible.

1.2 USBP BACKGROUND

The mission of CBP is to prevent terrorists and terrorist weapons from entering the United States, while also facilitating the flow of legitimate trade and travel. In supporting CBP's mission, USBP is charged with establishing and maintaining effective control of the international borders of the United States. USBP's mission strategy consists of the following five main objectives:

- Establish substantial probability of apprehending terrorists and their weapons as they attempt to enter illegally between the Ports of Entry (POEs)
- Deter illegal entries through improved enforcement
- Detect, apprehend, and deter smugglers of humans, drugs, and other contraband
- Leverage "smart border" technology to multiply the effect of enforcement personnel
- Reduce crime in border communities and consequently improve quality of life and economic vitality of targeted areas.

USBP has nine administrative sectors along the U.S./Mexico international border. Each sector is responsible for implementing an optimal combination of personnel, technology, and infrastructure appropriate to its operational requirements. The USBP Del Rio Sector is responsible for 59,541 square miles of Texas and 210 miles of the U.S./Mexico international border. The USBP Del Rio Sector stations are located in Abilene, Brackettville, Carrizo Springs, Comstock, Del Rio, Eagle

Pass, Llano, Rocksprings, San Angelo, and Uvalde, Texas (CBP undated). Within the USBP Del Rio Sector, areas for tactical infrastructure improvements have been identified that will help the Sector gain more effective control of the border and significantly contribute to USBP's priority mission of homeland security.

1.3 GOALS AND OBJECTIVES OF THE PROJECT

The Project will provide USBP agents with the tools necessary to strengthen their control of the U.S. border between POEs in the USBP Del Rio Sector. The Project will help to deter illegal entries within the USBP Del Rio Sector by improving enforcement efficiency, thus preventing terrorists and terrorist weapons, illegal aliens, drugs, and other cross border violators and contraband from entering the United States, while providing a safer work environment for USBP agents. The USBP Del Rio Sector has identified two discrete areas along the border that experience high levels of illegal cross-border activity. Illegal cross-border activity typically occurs in areas that are remote and not easily accessed by USBP agents, near POEs where concentrated populations live on either side of the border, or in locations that have quick access to U.S. transportation routes.

The Project is being carried out pursuant to Section 102 of IIRIRA, 8 United States Code (U.S.C.) § 1103 note. In Section 102(b) of IIRIRA, Congress called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwestern border. This total includes certain priority miles of fencing that are to be completed by December of 2008. Section 102(b) further specifies that these priority miles are to be constructed in areas where it would be practical and effective in deterring smugglers and aliens attempting to gain illegal entry into the United States.

1.4 DESCRIPTION OF THE PROJECT

CBP plans to install fencing, vehicle barriers, roads, and lighting along 4 miles of the U.S./Mexico international border. The fencing, barriers, and roads will be installed in areas of high illegal cross-border activity.

The Project includes installation of primary pedestrian fence sections in areas of the border that are not currently fenced. The locations of tactical infrastructure are based on a USBP Del Rio Sector assessment of local operational requirements where such infrastructure will assist USBP agents in reducing illegal cross-border activities.

The tactical infrastructure will be constructed in two discrete sections within the USBP Del Rio Sector in the city of Del Rio in Val Verde County and in the city of Eagle Pass in Maverick County. The individual sections will be approximately 3 miles and 1 mile in length, respectively. Each tactical infrastructure section will be an individual project that may proceed independent of the other section. The two sections of tactical infrastructure are designated as Sections M-1 and M-2A. **Table 1-1** provides a general description of the two tactical infrastructure sections.

Table 1-1. Tactical Infrastructure Sections for USBP Del Rio Sector

Section Number	Associated USBP Station	General Location	Land Ownerships	Type of Tactical Infrastructure	Length of New Fence Section
M-1	Del Rio	Del Rio, Texas	City of Del Rio/Multiple Private	Primary pedestrian fence, patrol/access roads, lights	2.3 miles
M-2A	Eagle Pass	Eagle Pass, Texas	City of Del Rio/Multiple Private	Primary pedestrian fence, patrol/access roads, lights	0.8 miles
				Total	**3.1 miles**

Design criteria that have been established based on USBP operational needs specify that, at a minimum, any primary pedestrian fencing must meet the following requirements:

- Built 15 to 18 feet high and extend below ground
- Capable of withstanding a crash of a 10,000-pound (gross weight) vehicle traveling at 40 miles per hour
- Capable of withstanding vandalism, cutting, or various types of penetration
- Semi-transparent, as dictated by operational needs
- Designed to survive extreme climate changes
- Designed to reduce or minimize effects on small animal movements
- Engineered not to impede the natural flow of surface water
- Aesthetically pleasing to the extent possible.

In addition, the United States Section, International Boundary and Water Commission (USIBWC) has design criteria for tactical infrastructure to avoid adverse impacts on the floodplain, levees, and flood control operations (USIBWC 2007). Examples of primary pedestrian and vehicle fence are included in **Appendix B.** The tactical infrastructure design that meets the USBP Del Rio Sector's operational needs are primary pedestrian fence with an aesthetic quality (Section M-1 and M-2A) and a concrete retaining wall (Section M-2A only). Additionally, USBP will construct, operate, and maintain permanent lighting along Sections M-1 and M-2A. Each light pole will be placed approximately 100 yards apart, and will be placed so that the riparian corridor will not be illuminated. The tactical infrastructure will also encroach on multiple privately and publicly owned land parcels. **Figures 1-1** and **1-2** show Sections M-1 and M-2A.

In Section M-1, the Project will parallel the USIBWC floodplain. Commencing just east of Cienegas Creek the Project will run for approximately 1.8 miles in a southeasterly direction parallel to Garza Lane, and then Rio Grande Road, to the intersection of Rio Grande Road and U.S. Highway 277. The Project will then extend 0.18 miles in a northeasterly direction, across Rio Grande Road to a point identified as the new toll facility for the new POE facilities currently under construction. Since Rio Grande Road will be fenced at the intersection with U.S. Highway 277, future through traffic will be diverted along Alderete Lane. The Project will recommence on the eastern side of the POE for an additional 0.36 of a mile. Section M-1 will be outside of the USIBWC floodplain and inside of the FEMA 100-year floodplain. Giant reed (an invasive species) and other brush will also be removed as part of the Project to improve line of sight for USBP agents. The impact corridor will be seeded with native grasses to provide soil stability and maintain an open space for patrol purposes. A portion of the land that will be between the western part of Section M-1 and the Rio Grande is owned by the City of Del Rio. In an agreement reached between the city and CBP, an area of approximately 35 acres, between the fence, the river and U.S. Highway 277 will be selectively cleared of underbrush and giant reed to create an open space park that will also add to line of sight security.

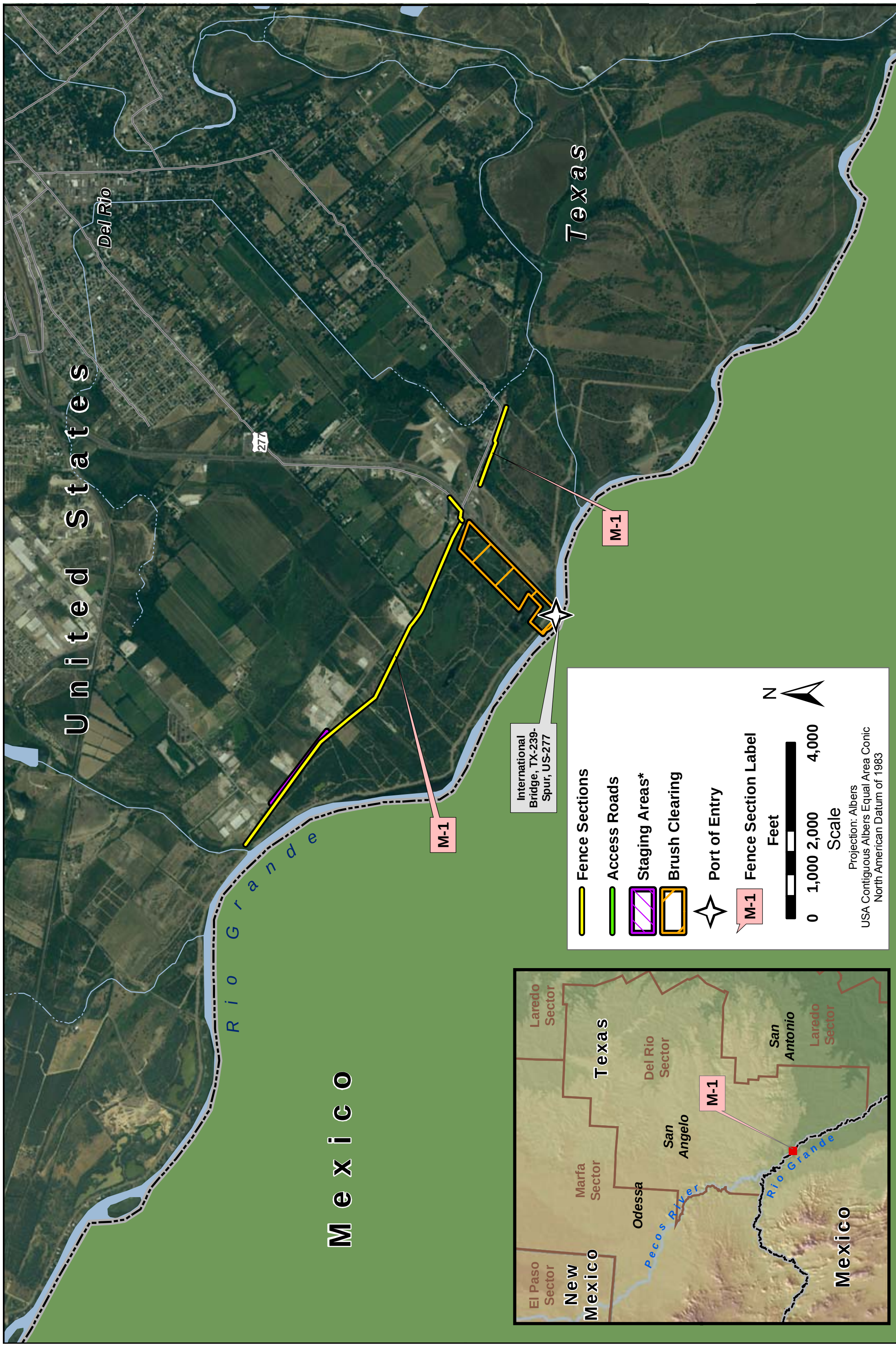
The tactical infrastructure will affect an approximately 150-foot-wide corridor along Section M-1. This corridor will include a primary pedestrian fence, patrol and access roads, and lights. In Section M-1, a new road will be needed for construction access and patrols along the impact corridor.

In Eagle Pass, the tactical infrastructure will generally follow the bank of the Rio Grande. Approximately 0.5 miles of Section M-2A will be a 15- to 18-foot-high concrete retaining wall and the remaining tactical infrastructure will be primary pedestrian fence with an aesthetic quality. In Section M-2A, existing roads will be used for construction access and staging areas. Improvement of existing patrol roads along the entire length of the primary pedestrian fence section is also included in the Project for Section M-2A. However, giant reed will not be cleared along the bank of the Rio Grande. The impact corridor will be revegetated as appropriate to maintain an open space for patrol purposes. Lights will also be installed. The tactical infrastructure will affect an approximately 60-foot-wide or smaller corridor along Section M-2A. In Section M-2A, the area affected by the construction of tactical infrastructure will total approximately 5 acres. **Figure 1-3** shows a schematic drawing of the impact corridor.

Section M-2A is inside of the FEMA 100-year floodplain and will connect to fence section M-2B which was evaluated and approved in a 2007 Environmental Assessment (EA) (CBP 2007). The EA for M-2B was released for a 30-day public review period beginning January 11, 2007 and ending February 9, 2007. During the EA process a total of two comments were received and the EA is available on the *www.BorderFencePlanning.com* Web site. Section M-2B will be primary pedestrian fence with an aesthetic quality and will run between two POEs along the west edge of downtown Eagle Pass and onto the city golf course. The golf course includes the western portion of Fort Duncan, which is a historic district listed in the National Register of Historic Places (NRHP). Fort Duncan was established in 1849 as the fifth in a cordon of forts along the Rio Grande to protect settlements and patrol the frontier. Permanent buildings were constructed by 1851, and additional ones constructed after the Civil War. In addition, the route of Section M-2B is in the vicinity of architectural resources listed in or eligible for the NRHP.

CBP is undertaking archaeological investigations to determine if there are any significant archaeological remains from Fort Duncan that might be affected by the Project. As part of the Project, the archaeological remains would be documented. In addition, an architectural survey of buildings and structures 40 years of age or older along the alignment of Section M-2B will be conducted. Although it is common for agencies to use 45 years from present as the threshold for the survey to allow a time buffer for planning projects, for the purposes of analysis in this ESP, 40 years was used instead of 45 years as requested by the SHPO.

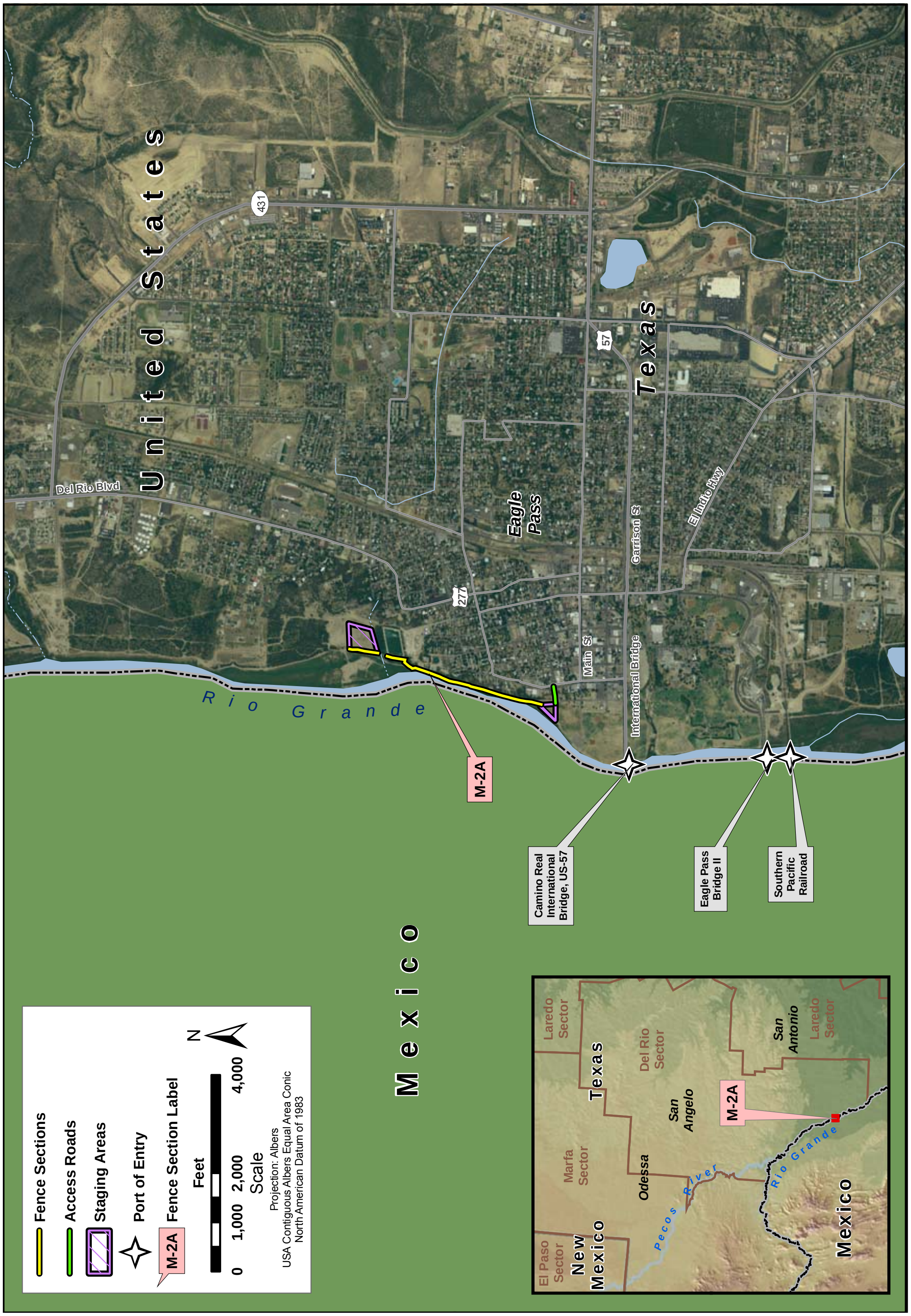
A historic context will be prepared and recommendations made regarding the NRHP eligibility of surveyed resources. The barracks ruins, Lee Building, and two other buildings at Fort Duncan will be documented with large-format photography, architectural description, and other information to the standards of the Historic American Buildings Survey for inclusion in the Library of Congress. A report detailing the conduct and findings of the cultural resources investigations will be prepared that meets Secretary of the Interior's Standards for Archeological Documentation and the Guidelines and Standards for Identification, as well as the standards and guidelines of the THC. CBP has coordinated the archaeological investigation and cultural resources documentation with the THC. Section M-2B is currently in the final engineering design phase and construction has yet to commence.



*Staging area is based on a file provided from USACE Galveston District on 31 March 2008 via e-mail and reconfirmed on 6 June 2008.

Source: ESRI StreetMap USA 2005

Figure 1-1. Location of the Section M-1, Del Rio, Texas



Source: ESRI StreetMap USA 2005

Figure 1-2. Location of the Section M-2A, Eagle Pass, Texas

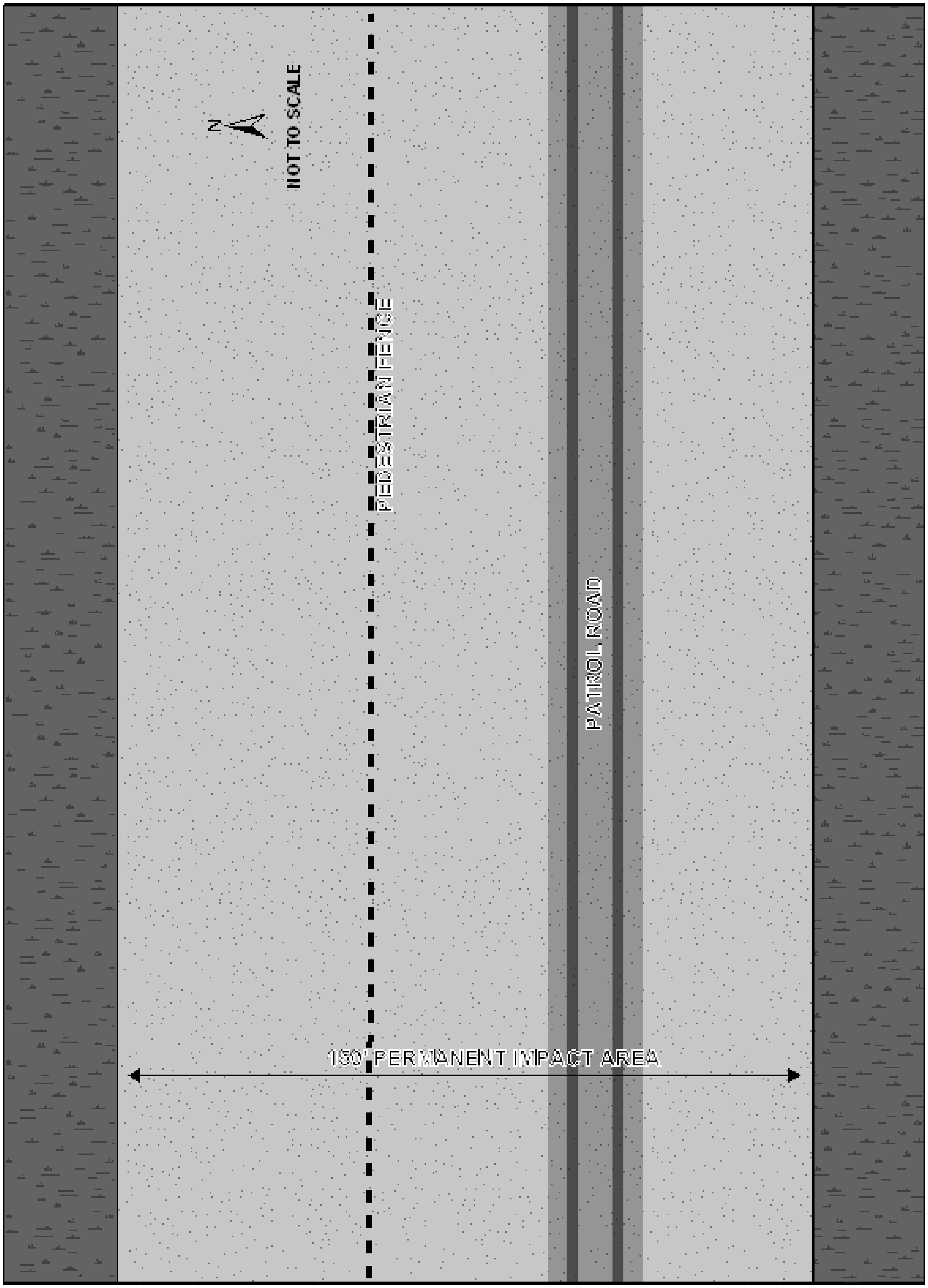


Figure 1-3. Schematic of Typical Project Corridor – Section M-1

Construction access roads will be 30 to 60 feet wide. Wherever possible, existing roads and previously disturbed areas will be used for construction access and staging areas. If fill material is needed, the construction contractor will use clean material from commercially available sources that do not pose an adverse effect on biological or cultural resources.

There will be no change in overall USBP Sector operations. The USBP Del Rio Sector activities routinely adapt to operational requirements, and will continue to do so under this Project. The USBP Del Rio Sector operations will retain the same flexibility to most effectively provide a law enforcement resolution to illegal cross-border activity.

Fence maintenance will either be performed by USBP Del Rio Sector personnel or contracted personnel. The fences will be made from nonreflective steel and no painting will be required. Fence maintenance will include removing any accumulated debris on the fence after a rain event to avoid potential future flooding. Sand that builds up against the fence and brush will also be removed, as needed. Brush removal could include mowing, removal of small trees, and application of herbicide, if needed. During normal patrols, Sector personnel will observe the condition of the fence. Any destruction or breaches of the fence will be repaired, as needed, by a contractor.

Construction of other tactical infrastructure may be required in the future as mission and operational requirements are continually reassessed. To the extent that other current and future actions are known, they are discussed in **Chapter 11**, Related Projects and Potential Effects.

1.5 PUBLIC OUTREACH AND COORDINATION

CBP notified relevant Federal, state, and local agencies of the Project and requested input on potential environmental concerns such parties might have regarding the Project. CBP has coordinated with the U.S. Environmental Protection Agency (USEPA); U.S. Fish and Wildlife Service (USFWS); State Historic Preservation Office (SHPO); and other Federal, state, and local agencies.

Along some of the fence sections the tactical infrastructure will follow rights–of–way (ROWs) administered, maintained, or used by the USIBWC. The IBWC is an international body composed of a U.S. Section and a Mexican Section, each headed by an Engineer-Commissioner appointed by its respective president. Each Section is administered independently of the other. The USIBWC is a Federal government agency headquartered in El Paso, Texas, and operates under the foreign policy guidance of the Department of State (USIBWC 2007). The USIBWC will provide access and ROWs to construct tactical infrastructure within the Del Rio Sector. The USIBWC will also ensure that design and placement of the tactical infrastructure does not impact flood control processes and does not violate treaty obligations between the United States and Mexico.

A Draft Environmental Assessment (EA) was prepared, copies were mailed to interested parties, it was posted on a public Web site, and a 30-day public review and comment period was announced. A public open house was advertised and held at the City of Del Rio Civic Center in Del Rio, Texas, on January 24, 2008. The open house was attended by 30 people. Although the Secretary issued the waiver, CBP has continued to work in a collaborative manner with agencies and has considered and incorporated agency and public comments into this ESP. CBP responses to public comments on the Draft EA will also be provided on the *www.BorderFencePlanning.com* Web site. Analyses from the Draft EA have been used to develop this ESP.

Although the Secretary of DHS issued the waiver, and thus, CBP has no responsibilities under the National Environmental Policy Act (NEPA) for this project, CBP reviewed, considered, and incorporated comments received from the public and other Federal, state, and local agencies, as appropriate, during the preparation of this ESP.

In addition to the past public involvement and outreach program, CBP has continued to coordinate with various Federal and state agencies during the development of this ESP. These agencies are described in the following paragraphs.

- U.S. Section, International Boundary and Water Commission. CBP has coordinated with USIBWC to ensure that any construction along the international border does not adversely affect International Boundary Monuments or substantially impede floodwater conveyance within international drainages.
- U.S. Army Corps of Engineers, Galveston District. CBP has coordinated all activities with USACE to identify potential jurisdictional waters of the United States, including wetlands, and to develop measures to avoid, minimize or compensate for losses to these resources.
- U.S. Fish and Wildlife Service. CBP has coordinated extensively with USFWS to identify listed species that have the potential to occur in the project area and has cooperated with the USFWS to prepare a Biological Resources Plan (BRP) that presents the analysis of potential effects to listed species and the BMPs proposed to reduce or off-set any adverse impacts. A copy of the BRP is contained in **Appendix G**.

1.6 BMPS AND MITIGATION PLAN

CBP applied various design criteria to reduce adverse environmental impacts associated with the Project, including selecting a route that will avoid or minimize effects on environmental and cultural resources. Nonetheless, CBP has determined that construction, operation, and maintenance of tactical infrastructure in USBP Del Rio Sector will result in adverse environmental impacts. These impacts will be most adverse during construction. Mitigation resources that are available during implementation of the Project include the following:

- CBP will require construction contractors to prepare Environmental Protection Plans (EPPs) that include BMPs on General Construction Activities, soils, cultural resources, air and water quality, noise, vegetation and biological resources. These BMPs are specified in construction documents. BMPs specifically developed to protect sensitive species are included in the Biological Resources Plan (see **Appendix F**).
- CBP will continue to consult with the USFWS, the Texas Department of Fish and Game (TxDFG), Texas SHPO, Native American tribes, and others to identify appropriate mitigation measures.

2. AIR QUALITY

2.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Clean Air Act (CAA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CAA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for air quality.

The air quality in a given region or area is measured by the concentrations of various pollutants in the atmosphere. The measurements of these "criteria pollutants" in ambient air are expressed in units of parts per million (ppm), micrograms per cubic meter ($\mu g/m^3$), or milligrams per cubic meter (mg/m^3).

The CAA directed USEPA to develop National Ambient Air Quality Standards (NAAQS), for pollutants that have been determined to affect human health and the environment. NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulate matter equal to or less than 10 microns in diameter [PM_{10}] and particulate matter equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb). The primary NAAQS are ambient air quality standards to protect the public health; secondary NAAQS specify levels of air quality to protect the public welfare such as effects on vegetation, crops, wildlife, economic values, and visibility.

The Federal CAA and USEPA delegated responsibility for ensuring compliance with NAAQS to the states and local agencies. The State of Texas has adopted the NAAQS as the Texas Ambient Air Quality Standards (TAAQS) for the entire State of Texas. **Table 2-1** presents the primary and secondary USEPA NAAQS that apply to the air quality in the State of Texas.

USEPA classifies the air quality in an air quality control region (AQCR), or in subareas of an AQCR, according to whether the concentrations of criteria pollutants in ambient air exceed the primary or secondary NAAQS. All areas within each AQCR are therefore designated as either "attainment," "nonattainment," "maintenance," or "unclassified" for each of the six criteria pollutants. Attainment means that the air quality within an AQCR is better than the NAAQS, nonattainment indicates that criteria pollutant levels exceed NAAQS, maintenance indicates that an area was previously designated nonattainment but is now in attainment, and unclassified means that there is not enough information to appropriately classify an AQCR, so the area is considered in attainment.

Table 2-1. National Ambient Air Quality Standards

Pollutant	Standard Value		Standard Type
CO			
8-hour Average [a]	9 ppm	(10 mg/m^3)	Primary and Secondary
1-hour Average [a]	35 ppm	(40 mg/m^3)	Primary
NO_2			
Annual Arithmetic Mean	0.053 ppm	(100 $\mu g/m^3$)	Primary and Secondary
O_3			
8-hour Average [b]	0.08 ppm	(157 $\mu g/m^3$)	Primary and Secondary
1-hour Average [c]	0.12 ppm	(240 $\mu g/m^3$)	Primary and Secondary
Pb			
Quarterly Average		1.5 $\mu g/m^3$	Primary and Secondary
PM_{10}			
Annual Arithmetic Mean [d]		50 $\mu g/m^3$	Primary and Secondary
24-hour Average [a]		150 $\mu g/m^3$	Primary and Secondary
$PM_{2.5}$			
Annual Arithmetic Mean [e]		15 $\mu g/m^3$	Primary and Secondary
24-hour Average [f]		35 $\mu g/m^3$	Primary and Secondary
SO_2			
Annual Arithmetic Mean	0.03 ppm	(80 $\mu g/m^3$)	Primary
24-hour Average [a]	0.14 ppm	(365 $\mu g/m^3$)	Primary
3-hour Average [a]	0.5 ppm	(1,300 $\mu g/m^3$)	Secondary

Source: USEPA 2007a

Notes: Parenthetical values are approximate equivalent concentrations.

[a] Not to be exceeded more than once per year.

[b] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[c] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1. As of June 15, 2005, USEPA revoked the 1-hour ozone standard in all areas except the 14 8-hour ozone nonattainment Early Action Compact Areas.

[d] To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 $\mu g/m^3$.

[e] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

[f] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$.

Many chemical compounds found in the Earth's atmosphere act as "greenhouse gases." These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Over time, barring other influences, the trapped heat results in the phenomenon of global warming.

In April 2007, the U.S. Supreme Court declared that carbon dioxide (CO_2) and other greenhouse gases are air pollutants under the CAA. The Court declared that the USEPA has the authority to regulate emissions from new cars and trucks under the CAA.

Many gases exhibit these "greenhouse" properties. The majority of greenhouse gases are created by natural sources but are also contributed to by human activity.

2.2 AFFECTED ENVIRONMENT

The Project is within Maverick and Val Verde counties, Texas, within the Metropolitan San Antonio Intrastate Air Quality Control Region (MSAI AQCR). The MSAI AQCR is composed of 21 counties in western Texas. Although portions of the MSAI AQCR are classified as being in nonattainment for 8-hour ozone, Maverick and Val Verde counties are classified as being in attainment/unclassified for all criteria pollutants.

2.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Pollutant emissions associated with the Project will not contribute to or affect local or regional NAAQS attainment status. Project activities will generate air pollutant emissions from the construction, maintenance activities, and the operation of generators to supply power to construction equipment and portable lights. BMPs will include a Dust Control Plan to minimize fugitive dust emissions.

Construction Projects. Minor short-term adverse effects will be expected from construction emissions and land disturbance associated with the Project. The Project will affect air quality primarily from site-disturbing activities and operation of construction equipment. The construction will generate total suspended particulate and PM_{10} emissions as fugitive dust from ground-disturbing activities (e.g., grading, trenching, soil piles) and from combustion of fuels in construction equipment. Fugitive dust emissions will be greatest during the initial site preparation activities and will vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area of land being worked and the level of construction activity.

Construction operations will also result in emissions of criteria pollutants as combustion products from construction equipment. These emissions will be of a temporary nature. The NAAQS emissions factors and estimates were generated based on guidance provided in USEPA AP-42, Volume II, *Mobile Sources*. Fugitive dust emissions for various construction activities were calculated using emissions factors and assumptions published in USEPA's AP-42 Section 11.9. The emissions for CO_2 were calculated using emissions coefficients reported by the Energy Information Administration (EIA 2007).

For purposes of this analysis, the Project duration and impact corridor that will be disturbed (presented in **Chapter 1**) were used to estimate fugitive dust and all other pollutant emissions. The construction emissions presented in **Table 2-2** include the estimated annual construction PM_{10} emissions associated with the Project. These emissions will produce slightly elevated short-term PM_{10} ambient air concentrations. However, the effects will be temporary, and will fall off rapidly with distance from the construction sites. As seen in **Table 2-2**, the emissions of NAAQS pollutants will not contribute to the deterioration of the air quality in the region. In addition, the effect of this Project on air quality will not exceed 10 percent of the regional values.

Table 2-2. Estimates of Total Construction Emissions from the Project in Tons Per Year

Description	NO_x	VOC	CO	CO_2	SO_x	PM_{10}
Construction Emissions	0.518	0.077	0.605	11.711	0.001	0.0171
Construction Fugitive Emissions	0.000	0.000	0.000	0.000	0.000	17.73
Maintenance Emissions	0.042	0.005	0.021	0.20	0.010	0.005
Generator Emissions	8.02	0.655	1.728	274	0.053	0.564
Total Project Emissions	**8.58**	**0.74**	**2.35**	**285.9**	**0.055**	**18.32**
Federal *de minimis* Threshold	NA	NA	NA	NA	NA	NA
MSAI AQCR Regional Emissions	111,196	112,137	671,869	1,395,000	50,220	192,504
Project Percent of MSAI AQCR Regional Emissions	**0.008**	**0.001**	**>0.001**	**0.021**	**>0.001**	**0.010**

Source: USEPA 2007b

The construction emissions presented in **Table 2-2** include the estimated annual emissions from construction equipment exhaust and operation of agricultural mowers and diesel-powered generators associated with the Project in Calendar

Year (CY) 2008. Early phases of construction projects typically involve heavier diesel equipment and earthmoving, resulting in higher nitrogen oxide (NO_x) and PM_{10} emissions. Later phases of construction projects typically involve more light gasoline equipment and surface coating, resulting in more CO and volatile organic compound (VOC) emissions. However, the effects will be temporary, fall off rapidly with distance from the construction sites, and will not result in any long-term effects.

Operations and Maintenance Activities. The tactical infrastructure will require mowing approximately two times per year to maintain vegetation height and allow enhanced visibility and security. It was assumed that two 40-horsepower (hp) agricultural mowers will mow the vegetation in the impact corridor approximately 14 days per year. No adverse effects on local or regional air quality will be expected from these maintenance activities. It is anticipated that future maintenance of tactical infrastructure will be conducted by contractors, and will primarily consist of welding and fence section replacements, as needed. Negligible long-term adverse impacts on air quality will be expected.

After construction is completed, USBP Del Rio Sector will begin patrols along Sections M-1 and M-2A. The vehicles used for surveillance of the existing border area are currently generating criteria pollutants and will not introduce new pollutant sources. Therefore, no net increase of criteria pollutant emissions will be expected from these patrol operations.

Generators. Project activities will require six diesel-powered generators to power construction equipment. It is assumed that these generators will be approximately 75 hp and operate approximately 8 hours per day for 120 working days. The use of generators is calculated to emit approximately 90 percent of Project emissions.

Greenhouse Gases. USEPA has estimated that the total greenhouse emissions for Texas were 189 million metric tons of carbon equivalent (MMTCE) in 1999. Of this, an estimated 1,395,000 tons of CO_2 were associated with the MSAI AQCR regions. Therefore, estimates of construction emissions of CO_2 will represent less than 10 percent of the regional emissions, as shown in **Table 2-2** (USEPA 2007c). Therefore greenhouse gas emissions are not expected to be major.

Current USBP operational activities will continue during and after construction. Vehicles that will patrol Sections M-1 and M-2A are currently in use and generate CO_2; therefore, no net increase of CO_2 emissions will be expected from the Project. Therefore, no net increase of greenhouse emissions will be expected.

Summary. The air emissions from the Project, as presented in **Table 2-2**, will be minor adverse and much less than 10 percent of the emissions inventory for MSAI AQCR (USEPA 2007b). Therefore, no adverse effects on regional or local air quality will be expected from the Project.

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3. NOISE

3.1 DEFINITION OF THE RESOURCE

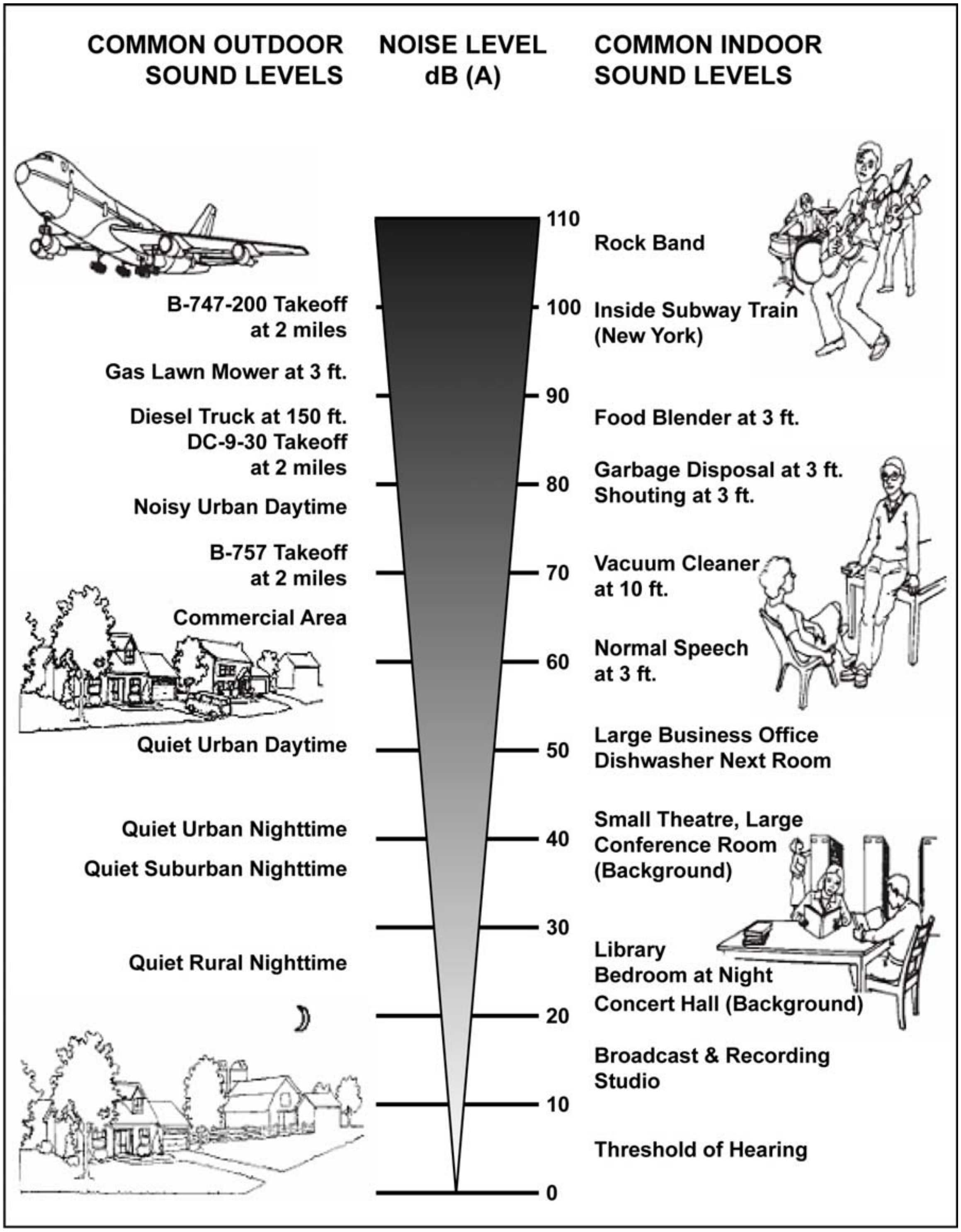
Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations on noise resources.

Noise and sound share the same physical properties, but noise is considered a disturbance while sound is defined as an auditory effect. Sound is defined as a particular auditory effect produced by a given source, for example the sound resulting from rain hitting a metal roof. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Sound or noise (depending on one’s perception) can be intermittent or continuous, steady or impulsive, and can involve any number of sources and frequencies. It can be readily identifiable or generally nondescript. Human response to increased sound levels varies according to the source type, characteristics of the sound source, distance between source and receptor, receptor sensitivity, and time of day. How an individual responds to the sound source will determine if the sound is viewed as music to one’s ears or an annoying noise. Affected receptors are specific (e.g., schools, churches, or hospitals) or broad (e.g., nature preserves or designated districts) in which occasional or persistent sensitivity to noise above ambient levels exists.

Sound is measured with instruments that record instantaneous sound levels in decibels (dB). A-weighted decibels (dBA) are sound level measurements used to characterize sound levels that can be sensed by the human ear. “A-weighted” denotes the adjustment of the frequency content of a sound-producing event to represent the way in which the average human ear responds to the audible event. Construction and vehicle noise levels are analyzed using dBA.

Noise levels in residential areas vary depending on the housing density, location, and surrounding use. As shown in **Figure 3-1**, a quiet urban area in the daytime is about 50 dBA, which increases to 65 dBA for a commercial area, and 80 dBA for a noisy urban daytime area.

Construction Sound Levels. Construction activities can cause an increase in sound that is well above the ambient level. A variety of sounds come from graders, pavers, trucks, welders, and other work processes. **Table 3-1** lists noise levels associated with common types of construction equipment that are likely to be used for the Project. Construction equipment usually exceeds the



Source: Landrum & Brown 2002

Figure 3-1. Common Noise Levels

Table 3-1. Noise Levels for Construction Equipment

Construction Category and Equipment	Predicted Noise Level at 50 feet (dBA)
Bulldozer	80
Grader	80–93
Truck	83–94
Roller	73–75
Backhoe	72–93
Jackhammer	81–98
Concrete mixer	74–88
Welding generator	71–82
Pile driver	91–105
Crane	75–87
Paver	86–88

Source: USEPA 1971

ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area.

In general, construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area. Pile driving will exceed ambient sound levels by approximately 25 to 35 dBA in an urban environment and 35 to 45 dBA in a quiet suburban area.

3.2 AFFECTED ENVIRONMENT

The two sections of tactical infrastructure will be in areas with different acoustical environments. Del Rio, Texas, directly abuts the U.S./Mexico international border, and sits across the Rio Grande from Ciudad Acuña, Mexico. The ambient acoustical environment near Del Rio is primarily affected by vehicle traffic, agricultural equipment, aircraft operations, and industrial noise sources. Noise levels for the majority of Del Rio are likely to be equivalent to a quiet rural or suburban area (30 to 50 dBA). The dominant noise sources adjacent to the border likely originate from residential or commercial sources.

Major transportation routes in the vicinity of Del Rio include U.S. Highway 277, State Route (SR) 90, and State Highway Spur 239. SR 277 passes through the northern side of Del Rio, running southeast to northwest and abuts several residential communities as it passes through the city. SR 90 runs north to south through central Del Rio and continues east from the city. SR 90 runs through many residential communities both to the north and east of Del Rio. State Highway Spur 239 runs northeast to southwest from central Del Rio to the

U.S./Mexico international border, and passes by several residential areas on the southwestern side of the city. State Highway Spur 239 handles a heavy volume of traffic that crosses the border in both directions. Additionally, there are several trucking companies along State Highway Spur 239, Garza Lane, and Rio Grande Road. Traffic from these businesses contributes to the ambient acoustic environment along the impact corridor in Section M-1.

Industrial and commercial facilities in the vicinity of Del Rio are present mainly on the western side of the city with some on the northern side. However, there are several commercial and industrial businesses along Garza Lane in the southwestern section of Del Rio as well. Noise from these facilities contributes to the ambient acoustic environment along the impact corridor in Section M-1.

Del Rio International Airport is approximately 1.5 miles northwest of downtown Del Rio. There is an average of 48 aircraft operations at Del Rio International Airport each day (AirNav 2007). Consequently, noise from aircraft operations contributes slightly to the ambient acoustic environment in the vicinity of Del Rio, especially in close proximity to the airport.

Along the U.S./Mexico international border in areas south of Del Rio, agricultural activities are prominent. Noise from agricultural equipment can reach up to 100 dBA for the operator (OSU 2007). Irrigation activities occurring at these farm sites will also contribute to the ambient acoustical environment at times when they are in operation. While farms are generally spread out, noise from agricultural activities is likely to extend past the farm boundaries. Noise generated by small farms near the impact corridor will have an effect on the acoustic environment of Section M-1.

Eagle Pass, Texas, directly abuts the U.S./Mexico international border, and sits across the Rio Grande from Piedras Negras, Mexico. The ambient acoustical environment near Eagle Pass is primarily affected by vehicular traffic and industrial noise sources. Noise levels in Eagle Pass are likely to be equivalent to a quiet suburban or urban area (40 to 65 dBA). Noise sources directly adjacent to the border likely originate from residential sources.

Major transportation routes in the vicinity of Eagle Pass include SR 57, SR 277, and Ranch Road 1021. SR 57 runs east to west through central Eagle Pass, and connects Eagle Pass to Piedras Negras. Cross-border traffic on SR 57 will contribute heavily to the ambient acoustical environment in the vicinity of the border station. SR 277 traverses north-south in Eagle Pass and then continues east from the city. Ranch Road 1021 runs northwest to southeast, passing through the town of Las Quintas Fronterizas, Texas. Each of these major transportation routes passes by several residential areas in the vicinity of Eagle Pass. Traffic along these roads contributes to the ambient acoustical environment. USBP currently uses patrol roads along the border and, therefore, USBP activities contribute to the acoustic environment along the border.

Industrial activities in Eagle Pass are concentrated mainly on the northeastern side of the city. There are several commercial operations in southwestern Eagle Pass. Noise from industrial activities and commercial operations, as well as traffic entering and leaving the facilities, contributes to the ambient acoustic environment of Section M-2A.

3.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Short-term, moderate to major adverse effects will be expected. Temporary sources of noise will include operation of construction equipment and vehicles. Noise from construction activities and vehicle traffic can affect wildlife as well as humans. Noise effects on wildlife, particularly birds and mid- to large-sized mammals, are described in **Chapter 7**.

Construction of the tactical infrastructure will result in noise effects on populations in the vicinity of the sites. Construction will result in increased noise levels associated with construction equipment used for grading, building, and possible pile-driving activities. Populations that could be affected by construction noise include adjacent residents; people visiting the adjacent recreation areas; or patrons and employees in nearby office, retail, or commercial buildings.

Noise from construction activities varies depending on the type of construction equipment being used, the area that the Project will occur in, and the distance from the source. To predict how these activities will affect adjacent populations, noise from construction was estimated. For example, as shown on **Table 3-1**, construction usually involves several pieces of equipment (e.g., a backhoe and haul truck) that can be used simultaneously. Under the Project, cumulative noise from construction equipment used during the busiest day was estimated to determine the total effect of noise from building activities at a given distance. Since noise attenuates over distance, a gradual decrease in noise level occurs the further a receptor is away from the source of noise. The closest residence in Del Rio and Eagle Pass will be approximately 100 feet from Section M-1. At this distance, anticipated noise levels from construction will be approximately 79 dBA. Possible pile-driving noise from the construction of the tactical infrastructure could reach 95 dBA for residents 100 feet from the construction.

Implementation of the Project will have temporary adverse effects on the acoustic environment from the use of heavy equipment during construction activities.

Increased noise levels from construction activities will affect residents as well as populations using recreational facilities. In general, users of recreational areas anticipate a quiet environment. Noise from construction will affect the ambient acoustical environment around these sites but will be temporary.

Noise effects from increased construction traffic will be temporary in nature. These effects will last only as long as the construction activities are ongoing. Most of the major roadways in the vicinity pass by residential areas. Therefore, short-term minor adverse noise effects are expected from an increase in traffic, most notably in the areas around SRs 277, 90, and 57.

Long-term, negligible, adverse effects on the acoustical environment will result from vehicle traffic patrols. While adjustments to USBP operations due to tactical infrastructure construction will be anticipated to be negligible, shifts in operation pattern, location, or frequency will affect the noise environment in the vicinity of the tactical infrastructure.

4. LAND USE AND VISUAL RESOURCES

4.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with land use.

The term land use refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws. There is, however, no nationally recognized convention or uniform terminology for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions.

Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas. Compatibility among land uses fosters the societal interest of obtaining the highest and best uses of real property. Tools supporting land use planning include written master plans/management plans and zoning regulations. In appropriate cases, the location and extent of the Project needs to be evaluated for its potential effects on the impact corridor and adjacent land uses. The Project was evaluated in terms of land use and its compatibility with any applicable land use or zoning regulations. Other relevant factors include matters such as existing land use in the impact corridor, the types of land uses on adjacent properties and their proximity to a project, the duration of the activity, and its permanence.

4.1.1 Affected Environment

The existing land use in the vicinity of the impact corridor includes well-developed urban centers of commerce (i.e., Del Rio and Eagle Pass), and open natural land. For the purposes of this ESP, a land use analysis was conducted using the National Land Cover Dataset. The National Land Cover Dataset is the first land cover mapping project with a national scope. Land cover and land use are closely related in that land uses commonly have similarly associated cover types, such as agricultural and residential. The National Land Cover Dataset provides 21 different land cover classes for the lower 48 states. The 21 land cover classes were generalized into the following 4 land classification categories: agricultural, developed, undeveloped, and water. The definitions of each category are defined below.

- *Agricultural* – Areas characterized by herbaceous vegetation that have been planted or are intensively managed for the production of food, feed, or fiber; or are maintained in developed settings for specific purposes. Specific land cover classes grouped for the agricultural classification include pasture/hay; row crops; small grains; fallow areas used for the production of crops that are temporarily barren or with sparse vegetative cover; and urban/recreational grasses consisting of vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

- *Developed* – Areas characterized by a high percentage (30 percent or greater) of constructed materials such as asphalt, concrete, and buildings. These include low- and high-intensity residential uses (e.g., single-family housing units and apartment complexes/rowhouses, respectively), and commercial/industrial/transportation infrastructure, which consists of all highly developed areas not classified as high-intensity residential and transportation infrastructure such as roads and railroad.
- *Water* – This land classification consists of all areas of open water (typically 25 percent or greater cover of water), including naturally occurring and man-made lakes, reservoirs, gulfs, bays, rivers, and streams; and perennial ice/snow, although no ice or snow was detected within the area analyzed for this ESP.
- *Undeveloped* – This land classification consists of the remaining 11 land cover classes not used for the agricultural, developed, and water land use classifications. These land cover classes include barren (bare rock/sand/clay, quarries/strip mines/gravel pits, and transitional), forested upland (deciduous forest, evergreen forest, and mixed forest), shrubland, nonnatural woody (orchards/vineyards/other), herbaceous upland (grasslands/herbaceous), and wetlands (woody wetlands and emergent herbaceous wetlands).

The following is a brief description of the land classifications and associated land uses within and adjacent to the impact corridor. The impact corridor traverses 17 land parcels in Section M-1 and 3 private and public land parcels in Section M-2A and is classified by approximately 43 percent developed land, 4.3 percent water, and 52 percent undeveloped land (see **Table 4-1**).

- *Agricultural* – sections M-1 and M-2A consist of no agricultural land.
- *Developed* – Approximately 43.2 percent of Sections M-1 and M-2A consist of developed lands. A majority of the developed land within Section M-1 is immediately north of Garza Lane, Rio Grande Road, and Qualia Drive, and consist of private residences, commercial entities, and other structures such as the Silver Lake Wastewater Treatment Plant.
- *Water* – There is no water within the impact corridor of Section M-1, however there are approximately 2 acres of water within Section M-2A, representing approximately 4.3 percent of the impact corridor.

- *Undeveloped* – The majority (52.5 percent) of the impact corridor consists of undeveloped land. The undeveloped land is privately and publicly owned.

Table 4-1. Land Classifications Within the Impact Corridor

Tactical Infrastructure Section Number	Land Classification (acres)				Total Acres	Total Percent
	Agricultural	Developed	Water	Undeveloped		
M-1	-	20.2	-	23.2	**43.3**	**89.0%**
M-2A	-	0.9	2.1	2.4	**5.4**	**11.0%**
Total Acres	**0.0**	**21.0**	**2.1**	**25.5**	**48.7**	
Total Percent	**0%**	**43.2%**	**4.3%**	**52.5%**		

4.1.2 Direct and Indirect Effects of the Project

Constructing the tactical infrastructure will result in long-term minor adverse effects on land use. Additionally, no land designated as agricultural will be affected by the Project. The figures in **Chapter 1.4** show the locations of the tactical infrastructure and the proximity of adjacent and intersecting land.

Short-term minor adverse effects will occur from construction. Effects on land use will vary depending on potential changes in land use and the land use of adjacent properties.

Construction of the tactical infrastructure will require the government to acquire various interests in land. Section M-1 will traverse 17 private and public land parcels in Del Rio, Texas, and Section M-2A will traverse 3 private and public land parcels in Eagle Pass, Texas. Property owners and residents could be directly, adversely affected by restricted access, visual effects (see **Chapter 4.2.3**), noise effects during construction (see **Chapter 3.3**), and other disruptions during construction. Under current law, the Secretary of Homeland Security has the authority to contract for or buy an interest in land that is adjacent to or in the vicinity of the U.S./Mexico international border when the Secretary deems the land essential to control and guard the boundaries and borders of the United States (8 U.S.C. § 1103(b)).

Because the tactical infrastructure will traverse both public and private lands, various methods could be used to acquire the necessary interests in land. These methods include, among other things, acquiring permanent easements, ROWs, or outright purchase in fee simple. There will be long-term major adverse effects on property owners who do not wish to sell their property or relocate, however, the adverse effects will be mitigated through compensation at fair market value for the property.

On private land, the government will likely purchase the land or some interest in land from the relevant landowner. Acquisition from private landowners will be a negotiable process that will be carried out between the government and the landowner on a case-by-case basis. The government also has the statutory authority to acquire such interests through eminent domain.

Gates may be installed in the primary pedestrian fence to provide landowners, whose properties will be affected, to provide access to other portions of their property to reduce potential inconvenience. Private and public developed and undeveloped lands within the impact corridor will not be available for future development.

4.2 VISUAL RESOURCES

4.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with visual resources.

CBP does not currently have a standard methodology for the analysis and assessment of effects on visual resources. Accordingly, a standard methodology developed by another Federal agency was adopted for the analysis and assessment of effects on visual resources for this ESP. Methodologies reviewed included those developed by the National Park Service (NPS), the Bureau of Land Management (BLM), and the Federal Highway Administration (FHWA). It was determined that the FHWA methodology was the most applicable for this analysis due to its focus on linear corridors that include a variety of features and cross-cut a variety of landscapes. The FHWA methodology examines visual resources in similar ways (texture, contrast, visual quality) as those of NPS and BLM, but unlike those methodologies, the FHWA does not tie the assessment to the management goals for a given parcel of land (i.e., BLM- and NPS-owned land parcels typically have specific management goals and the assessment of effects on visual resources within a given parcel is tied to the management priorities for those parcels).

The discussion in the following paragraphs summarizes the methology presented in FHWA Publication No. FHWA-HI-88-054: *Visual Impact Assessment for Highway Projects* (USDOT undated). Under the FHWA approach, the major components of the visual analysis process include establishing the visual environment of a project, assessing the visual resources of the project area, and identifying viewer response to those resources.

Establishing a Visual Environment. Two related steps are performed to characterize the visual environment: (1) develop a framework for visual assessment for the project area, and (2) define the physical limits of the visual environment that a project might affect. The landscape classification process establishes the general visual environment of a project and its place in the regional landscape. The starting point for the classification is an understanding of the landscape components that make up the regional landscape, which then allows comparisons between landscapes. Regional landscapes consist of landforms (or topography) and land cover. It should be noted that land cover is not equivalent to land use, as that term is defined and used in **Chapter 4.1.1**. Land cover is essential to the identification of what features (e.g., water, vegetation, type of man-made development) dominate the land within a given parcel. Examples of land cover include agricultural field, residential development, airport, forest, grassland, and reservoir. While there is some overlap with land use, land cover does not distinguish function or ownership of parcels.

Relatively homogenous combinations of landforms and land cover that recur throughout a region can be considered landscape types. To provide a framework to determine the visual effects of the Project, the regional landscape is divided into distinct landscape units; these are usually enclosed by clear landform or land cover boundaries and many of the views within the unit are inward-looking. Landscape units are usually characterized by diverse visual resources, and it is common for several landscape types to be in view at any one time.

Assessing the Visual Resources. An assessment of the visual resources within a project area involves characterization of the character and quality of those resources. Descriptions of visual character can distinguish at least two levels of attributes: pattern elements and pattern character. Visual pattern elements are primary visual attributes of objects; they include form, line, color, and texture. Awareness of these pattern elements varies with distance. The visual contrast between a project and its visual environment can frequently be traced to four aspects of pattern character: dominance, scale, diversity, and continuity.

Visual quality is subjective, as it relies on the viewer's enjoyment or interpretation of experience. For example, there is a clear public agreement that the visual resources of certain landscapes have high visual quality and that plans for projects in those areas should be subject to careful examination. Approaches to assessing visual quality include identifying landscapes already recognized at the national, regional, or local level for their visual excellence (e.g., National Historic Landmarks [NHLs], National Scenic Rivers); asking viewers to identify quality visual resources; or looking to the regional landscape for specific resource indicators of visual quality. One evaluative approach that has proven useful includes three criteria: vividness (the visual power or memorable character of the landscape), intactness (the visual integrity of the natural and man-made landscape and its freedom from encroaching elements), and unity (the visual coherence and compositional harmony of the landscape considered as a whole). A high value for all three criteria equates to a high visual quality; combinations of lesser values indicate moderate or low visual quality. It should be noted that low visual quality does not necessarily mean that there will be no concern over the visual effects of a project. In instances such as urban settings, communities might ask that projects be designed to improve existing visual quality.

Identifying Viewer Response. An understanding of the viewers who might see the project and the aspects of the visual environment to which they are likely to respond is important to understanding and predicting viewer response to the appearance of a project. The receptivity of different viewer groups to the visual environment and its elements is not equal. Viewer sensitivity is strongly related to visual preference; it modifies visual experience directly by means of viewer activity and awareness, and indirectly by means of values, opinions, and preconceptions. Because viewers in some settings are more likely to share common distractions, activities, and awareness of their visual environment, it is reasonable to distinguish among project viewers located in residential, recreational, and industrial areas.

Visual awareness is the extent to which the receptivity of viewers is heightened by the immediate experience of visual resource characteristics. Visual change heightens awareness of, for example, a landscape transition, such as entering a mountain range or a major city, and can heighten viewer awareness within that particular viewshed. Measures that modify viewer exposure, such as selective clearing or screening, can also be deliberately employed to modify viewer awareness. Viewers also tend to notice and value the unusual, so they might see more value in preserving the view towards a particularly dramatic stand of trees than the view towards more ubiquitous landscape features.

Local values and goals operate indirectly on viewer experience by shaping view expectations, aspirations, and appreciations. For example, at a regional or national level, viewers might be particularly sensitive to the visual resources and appearance of a particular landscape due to its cultural significance, and any visual evidence of change might be seen as a threat to these values or resources. Concern over the appearance of the project often might be based on how it will affect the visual character of an area rather than on the particular visual resources it will displace.

Aesthetics is the science or philosophy concerned with the quality of visual experience. One cannot meaningfully assess the effects of an action on visual experience unless one considers both the stimulus (visual resources) and the response (viewers) aspects of that experience.

4.2.2 Affected Environment

Visual Environment. Primary landform types present within the project area includes the Rio Grande channel and that of a stream that intersects the Rio

Grande on the south side of Del Rio in Section M-1, the floodplains and terraces of those waterways, and the bluff along the river in Section M-2A. Within the Rio Grande terrace are a number of oxbow lakes, some containing water, and some only visible as traces on aerial photographs.

Land cover overlying these landforms can be simplified into four primary types: agricultural, developed, undeveloped, and water, with developed composing the dominant land cover type in Sections M-1 and M-2A (see **Chapter 4.1.2**). There are also certain features that cross-cut or link land cover types, such as transportation features (e.g., highways, paved and unpaved roads, bridges).

Although there is significant development in both Sections M-1 and M-2A, views that contain only undeveloped areas remain within each section. Accordingly, the most applicable landscape unit types that can be defined for these sections are undeveloped and urban/industrial. **Figures 4-1** and **4-2** show the range of variation of views within these landscape units.

Figure 4-1. Photograph View of Del Rio Residential Areas (Section M-1)

The undeveloped unit includes the terraces and floodplain of the Rio Grande where they are overlain by undeveloped, open areas. The underlying landforms are clearly visible and play the primary role in the layout or location of overlying features. Typical features include field breaks, dirt roads, and isolated structures such as electrical transmission lines or water tanks.

Figure 4-2. Photograph View of Rio Grande Channel from Bluff (Section M-2A)

The urban/industrial unit includes the terraces of the Rio Grande where they are overlain by moderate- to high-density mixed use development. The underlying landforms are almost completely masked by man-made features and play little or no role in the layout or location of overlying features. Typical features include buildings of varying heights, sizes, and materials; a mixture of gridded and nongridded road networks (primarily paved); planned park areas (often near water sources); open paved areas (e.g., parking areas); the larger POEs; industrial and commercial areas; overhead utility lines on poles; elevated roadways and overpasses; and elevated signage.

Character and Quality of Visual Resources. **Tables 4-2** and **4-3** provide summaries of the visual character and quality, respectively, of visual resources observed within the landscape units within the USBP Del Rio Sector. Values reflect visual character and visual quality of resources visible from distances of 50 feet to 1,000 feet (see **Figure 4-3**). Typically, the amount of visual clutter between the viewer and the impact corridors will increase with distance.

In terms of visual quality, this analysis presumes that any view that includes the Rio Grande constitutes a high-quality view, except for views dominated by industrial or commercial elements (e.g., views of the POEs). Similarly, given that quality of view can be somewhat subjective, it is possible to find at least one low- and one high-quality view within any landscape unit type. Rather than simply provide a range of ratings of low to high for each, the quality of the most common views within a given landscape unit type was used.

Table 4-2. Character of Visual Resources within Typical Del Rio Sector Landscape Units (Current Conditions)

Landscape Unit	Line	Color	Form	Texture
Undeveloped	Primarily horizontal lines (fields, roads, canals), with occasional vertical elements (utility towers, tree lines, buildings)	Earthy colors (bare earth and crops)	Mixture of angled and curved forms (roads and buildings vs. rolling hills and meandering river)	Relatively subtle variations in texture (mostly bare earth or crops)
Urban/ Industrial	Vertical lines more prominent than horizontal, except for viewers on the river side of Del Rio in Section M–1	Often a high variety of colors associated with buildings, signs, green spaces	Primarily rectilinear forms but can be punctuated by curves from more elaborate architecture or organic shapes of natural elements	Variety of textures related to different building materials against natural textures in green spaces

Table 4-3. Quality of Visual Resources within Typical Del Rio Sector Landscape Units (Current Conditions)

Landscape Unit	Vividness	Intactness	Unity	Rating
Undeveloped	Moderate	Moderate/High	Moderate/High	Moderate/High
Urban/Industrial	Low to High	Moderate	Low to High	Moderate

In addition to these averaged assessments of visual character and quality of resources within each landscape unit type, there are a number of specific visual resources considered to be of particular importance because of their natural or cultural value, such as those listed in the following:

- Brinkley Mansion (Texas Historical Landmark, Section M-1)
- Maverick County Courthouse (Section M-2A)
- 420 Commercial Street (Texas Historical Landmark, Section M-2A)
- Church of the Redeemer (Texas Historical Landmark, Section M-2A)
- Eagle Pass Post Office (Texas Historical Landmark, Section M-2A)
- S.P. Simpson Jr. House (Texas Historical Landmark, Section M-2A)
- Shelby Park (Section M-2A)
- Eagle Pass Golf Course (Section M-2A).

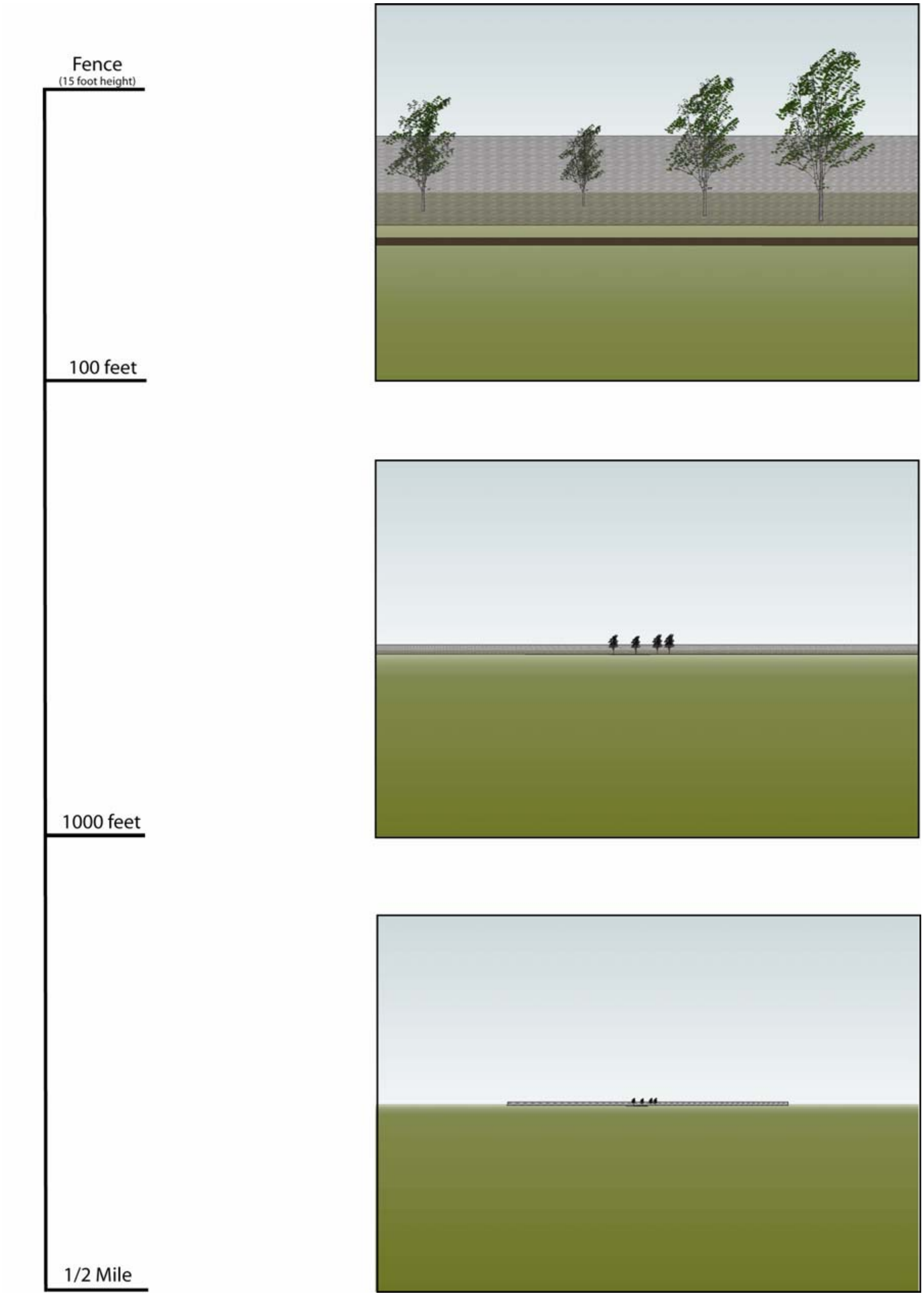


Figure 4-3. Schematic Showing Visibility of Fencing at Various Distances

Viewer Response. The pool of viewers making up the affected environment includes single individuals, such as rural landowners on whose property the primary pedestrian fence will be constructed, and groups of individuals such as residents and business owners in the cities of Del Rio and Eagle Pass, or recreational users of public access recreation areas. Viewers could also include advocational groups such as local historical societies or local chapters of the National Audubon Society that have interests in preserving the settings of cultural or natural resources. These viewers are likely to have both individual responses to specific resources related to their experiences and emotional connection to those resources, as well as collective responses to visual resources considered to be important on a regional, state, or national level. Although individual viewer responses will be captured where possible from viewer comments, for the purposes of this analysis, the pool of affected viewers will be grouped into the following general categories:

- Residential viewers
- Urban residents
- Commercial viewers
  - Urban businesses
- Industrial viewers
  - Town and urban
- Recreational viewers
  - Tourists visiting towns and cities
- Special interest viewers
  - Native American tribes
  - Local historical societies
  - Local chapters of conservation societies (e.g., Audubon Society)
  - Park commissions
  - Regulatory agencies (e.g., USFWS, Texas Historical Commission [THC])
- Intermittent viewers (view primarily from transportation corridors)
  - Commuters
  - Commercial (e.g., vehicle drivers).

Within each of these categories, viewer response will also vary depending on the typical duration of exposure to visual resources and the typical distance from which they view those resources. For example, a residential viewer who currently has an unobstructed view of a high-quality resource from their backyard will be affected differently than a residential viewer who lives several streets away and already has an obstructed view of those resources, or a viewer that only views the resource from the highway as they pass through the region.

4.2.3 Direct and Indirect Effects of the Project

The Project will affect visual resources both directly and indirectly. Construction of tactical infrastructure will result in the introduction of both temporary (e.g., heavy equipment, supplies) and permanent (e.g., fencing and patrol roads) visual elements into existing viewsheds. Clearing and grading of the landscape during construction will result in the removal of visual elements from existing viewsheds. Finally, the primary pedestrian fence sections will create a physical barrier potentially preventing access to some visual resources.

Effects on aesthetic and visual resources will include short-term effects associated with the construction phase of the Project and use of staging areas, recurring effects associated with monitoring and maintenance, and long-term effects associated with the completed Project. Effects can range from minor, such as the effects on visual resources adjacent to the impact corridor when seen from a distance or when views of primary pedestrian fences are obstructed by intervening elements (e.g., trees, buildings) to major, such as the intrusion of primary pedestrian fence sections into high-quality views of the Rio Grande or the setting of an NHL. The nature of the effects will range from neutral for those land units containing lower quality views or few regular viewers, to adverse, for those land units containing high-quality views, important cultural or natural resources, or viewers who will have constant exposure to the primary pedestrian fence at close distances. Beneficial effects are also possible (e.g., addition of the primary pedestrian fence increases the unity or dramatic effect of a view, removal of visual clutter within the impact corridor clarifies a view, or a viewer positively associates the primary pedestrian fence with a feeling of greater security), but are considered to be less common.

Project Characteristics. The primary introduced visual elements associated with the Project in Section M-1 will be the single line of fencing, gates, patrol and access roads, and construction clutter (e.g., stockpiles of supplies and heavy equipment during construction). The Project will also potentially remove existing visual elements, such as buildings, vegetation, and subtle landforms (through grading or filling) that occur within the impact corridor. Finally, the primary pedestrian fence will act as a physical barrier between viewers and those views that can only be viewed from vantage points on the other side of the fence.

The addition of fencing and the associated patrol road, removal of existing elements from the impact corridor in Section M-1, and the loss of access to specific visual resources due to the fact that the primary pedestrian fence is a barrier, will have long-term effects on visual resources, while the remaining elements will have temporary or short-term effects limited to the period of construction. The nature (adverse or beneficial) and degree (minor to major) of the long-term effects can be affected by the appearance of the fencing (width, height, materials, color), the patrol road (paved or unpaved, width), the lighting configuration (number of lighting poles, number of lights per pole, angle and screening of lights), and the access roads (number, paved or unpaved, width).

In all cases, removal of existing elements will have the net result of exposing more of the primary pedestrian fence, patrol road, and other tactical infrastructure. In settings where the addition of the fence is considered to have a major adverse effect on visual resources, any benefit occurring from removal of existing elements will be outweighed by the more dominant adverse visual effect of the primary pedestrian fence.

The effects associated with the loss of access to specific visual resources in Section M-1 and the northern portion of Section M-2A can be affected primarily by the placement of the primary pedestrian fence relative to those resources and inclusion of gates that allow access to those resources. CBP has already included provisions for a number of gates to allow access to agricultural fields, businesses, and cemeteries. These gates also allow access to some of the visual resources that will otherwise be blocked.

The patrol road will be the existing road between the bluff and the river bank. The primary new visual addition to the corridor will be lighting poles, placed at approximately 100-yard intervals along the patrol road. Clearing of vegetation and some cutting of the bluff will likely be required as part of the retaining wall construction.

Visual Resource Concerns. In **Chapter 4.2.2**, **Tables 4-2** and **4-3** provide a summary of the character and quality of visual resources currently present within the impact corridor. **Tables 4-4** and **4-5** show how implementation of the Project will likely alter the character and quality of existing visual resources within each landscape unit. **Figures 4-4** and **4-5** provide examples of typical effects; these images show the effects associated with the addition of a fence constructed using a type of primary pedestrian fence currently being constructed in other USBP sectors. These photographs provide approximations of the degree of alteration that will result from introduction of the primary pedestrian fence and patrol road to these viewsheds.

In Section M-1, most viewers would look out towards the Rio Grande and, beyond that, to an urban landscape backed by mountains. In Section M-2A, viewers are closer to the Rio Grande, but views on the opposite bank are primarily natural vegetation backed by mountains. Views in the southern portion of Section M-2A could also include Shelby Park or the Eagle Pass Golf Course in the foreground, the international bridge and Eagle Pass POE and the Rio Grande in the mid-ground, and an urban landscape backed by mountains in the distance.

From within Del Rio or Eagle Pass, typically greater screening of the primary pedestrian fence will be expected due to the greater variety of lines, colors, forms, and textures present. More common occurrences of other tactical infrastructures and tall or massive forms will also increase the ability of the tactical infrastructure to blend with its surroundings in Section M-1 and the northern part of Section M-2A. The effect of the tactical infrastructure at closer

Table 4-4. Effect on the Character of Visual Resources within Typical Del Rio Sector Landscape Units

Landscape Units	Line	Color	Form	Texture
Undeveloped	At short distances the fence will introduce a primarily horizontal line that might blend with other dominant horizontal lines. With greater distance, the vertical posts of the fence might blend where other vertical elements are present (power poles, remote video surveillance system) depending on the height of those elements in each area. The regularity of the lines could contrast with less regular lines.	The current fence design parameters call for fencing to be black. Although the vertical posts in the fence might blend with tree trunks, choice of a color scheme that matches the dominant vegetation will reduce the impact.	The fence and patrol road are rectilinear in form and might result in greater domination of rectilinear forms compared to organic forms when viewed at a distance.	As a man-made, synthetic element, the fence will contrast with the dominant textures of this land unit. The patrol roads and access roads will not alter the viewshed for most rural landscapes, as a number of roads and field breaks are already present in this land unit.
Urban/ Industrial	In Section M-1, views include a mix of vertical and horizontal lines. In Section M-2A, linear elements are more typically horizontal. The introduction of additional linear features will be consistent with the existing landscape from a distance. In closer proximity, however, the height and regularity of the fence line will likely contrast with existing lines.	The pedestrian fence planned for all sections except the southern portion of Section M-2A is black, which might blend or contrast with its surroundings depending on the colors in the foreground and background.	Against a more natural or organic background, such as what viewers see in Section M-2A, the fence will be a noticeable contrast. Against a more developed background (Section M-1), the form and massing of the fence will be less of a contrast.	Except where the fence will be constructed within or immediately adjacent to existing development, the texture of the fence will contrast with natural elements around it. From a distance, the texture of the fence will blend against urban backgrounds that contain mixed textures, but will stand out relative to more natural backgrounds.

Table 4-5. Quality of Visual Resources within Typical Del Rio Sector Landscape Units after Construction

Land Units	Vividness	Intactness	Unity	Rating
Undeveloped	Moderate	Moderate/High	Moderate	Moderate
Urban/Industrial	Low to Moderate	Low/Moderate	Low to Moderate	Moderate

Figure 4-4. Typical Views Towards Impact Corridor, Section M-1

Figure 4-5. Typical Views Towards Impact Corridor, Section M-2A (Northern Portion)

distances will vary depending on its immediate setting; the more exposed the primary pedestrian fence is the greater the contrast between it and surrounding elements, and the greater the visual effect. For Section M-1 and the northern part of Section M-2A, the impacts will range from minor to major, and neutral to adverse. The FHWA guidance (USDOT undated) cites examples where the addition of a consistent aesthetic element to an urban setting helps create greater unity to the views within the land unit, thus resulting in a beneficial effect. Although this outcome is possible within this land unit type, a review of the settings along the impact corridor suggests that the best-case scenario will be a neutral or minor adverse effect.

In the southern part of Section M-2A, where the primary pedestrian fence will consist of a retaining wall on the river side of the existing bluff, the primary effect related to the Project will be from the lighting along the patrol road. The poles themselves should blend with existing visual clutter at a distance, but will be noticeable intrusions in the back yards of people living along the bluff. Perhaps more importantly, though, the pool of light generated by the lights will be a new visual element in the nighttime view for anyone looking towards the Rio Grande in this direction; depending on the intensity of the light and the amount of background lighting associated with the POE and the development across the river in Mexico, the pool of light might blend or stand in stark contrast to a typically dark setting. Accordingly, effects on visual resources in the southern part of Section M-2A will range from minor to major, and neutral to adverse.

Finally, with respect to the effects on the specific visual resources, implementation of the Project is expected to have short- or long-term adverse effects on the settings of those resources. The greater the distance between the resource and the intrusive visual elements (primarily the primary pedestrian fence), and the more intervening visual elements between them, the less the degree of the effect. For example, construction of the primary pedestrian fence at a distance of 60 feet from a historic building will typically constitute a major adverse effect, while construction of the primary pedestrian fence several hundred feet from the resource with intervening vegetation or buildings will reduce the effect to moderate or minor. Placement of the fence within the boundaries of an NHL or historic district, particularly where there is a high degree of visual continuity between resources (few noncontributing elements) will also be considered a major adverse effect on that resource. A more detailed discussion of the effects on the settings or viewsheds of specific cultural resources is provided in **Chapter 8**.

Viewer Response Concerns. In many respects, the principle of “not in my backyard” has a strong correlation with the responses of viewers for whom view of the primary pedestrian fence will be regular or constant (i.e., residential, commercial, or industrial viewers). Where the primary pedestrian fence will directly affect private property, the viewer response from the landowner will likely be that the Project will represent a major adverse effect on visual resources visible from their property. In the case of the properties in Eagle Pass, however, the use of a retaining wall on the back side of the bluff might be considered less of an adverse effect than the clearing of vegetation from the impact corridor. As vegetation is re-established along the banks of the Rio Grande, the long-term effect might become neutral. There is also a possibility that the viewer response in this instance could be beneficial, based on a feeling of increased safety or security (e.g., fence as protection). Responses from viewers located a greater distance from the primary pedestrian fence, particularly if their view of the fence is obstructed by other elements or is simply part of the overall visual clutter, will typically be less intense (minor) and more likely neutral, unless the fence will obstruct a visual resource considered to be of high quality or of cultural importance. In general, the closer the proximity of the viewer to the fence, the more likely the response is to be major and adverse.

For viewers likely to view the primary pedestrian fence on a less-regular basis (i.e., recreational viewers, special interest viewers, intermittent viewers), viewer responses will be tied to perception of how the tactical infrastructure will alter their access (i.e., impede existing views or impede physical access to views) to valued visual resources. Although any of these groups might object on principle to any type of alteration or feel a beneficial response due to a sense of increased security, responses will be more intense and adverse where alterations downgrade the quality or character of existing visual resources.

As a final point, for viewers accustomed to accessing views available from settings other than parks or refuges, the construction of the tactical infrastructure will place a permanent barrier between the viewer and the visual resources in those locales. By presumption, any visual resource regularly sought out by a viewer will constitute a moderate- or high-quality visual resource; and restricting physical access to those resources will thus constitute a long-term major adverse effect for those viewers.

5. GEOLOGY AND SOILS

5.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with geological and soils resources.

Geology and soils resources include the surface and subsurface materials of the earth. Within a given physiographic province, these resources typically are described in terms of topography, soils, geology, minerals, and paleontology, where applicable.

Topography is defined as the relative positions and elevations of the natural or human-made features of an area that describe the configuration of its surface. Regional topography is influenced by many factors, including human activity, seismic activity of the underlying geological material, climatic conditions, and erosion. Information describing topography typically encompasses surface elevations, slope, and physiographic features (i.e., mountains, ravines, or depressions).

Site-specific geological resources typically consist of surface and subsurface materials and their inherent properties. Principal factors influencing the ability of geological resources to support structural development are seismic properties (i.e., potential for subsurface shifting, faulting, or crustal disturbance), topography, and soil stability. Soils are the unconsolidated materials overlying bedrock or other parent material. They develop from weathering processes on mineral and organic materials and are typically described in terms of their landscape position, slope, and physical and chemical characteristics. Soil types differ in structure, elasticity, strength, shrink-swell potential, drainage characteristics, and erosion potential, which can affect their ability to support certain applications or uses. In appropriate cases, soil properties must be examined for compatibility with particular construction activities or types of land use.

Prime and unique farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of a specific crop when treated and managed according to acceptable farming methods. Soil qualities, growing season, and moisture supply are needed for well-managed soil to produce a sustained high yield of crops in an economic manner. The land could be cropland, pasture, rangeland, or other land, but not urban built-up land or water. The intent of the FPPA is to minimize the extent that Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. The FPPA also ensures that Federal programs are administered in a manner that, to the extent practicable, will be compatible with private, state, and local government programs and policies to protect farmland.

The FPPA and Natural Resources Conservation Service (NRCS) pertain to activities on prime and unique farmland, as well as farmland of statewide and local importance (see 7 CFR Part 658, 5 July 1984). Determination of whether an area is considered prime or unique farmland and potential impacts associated with a project is based on preparation of the Farmland Conversion Impact Rating Form AD-1006 for areas where prime farmland soils occur and by applying criteria established at Section 658.5 of the FPPA (7 CFR 658).

5.2 AFFECTED ENVIRONMENT

Physiography and Topography. Section M-1 in Del Rio, Texas, is on Edwards Plateau. The Edwards Plateau is known for the extent and quality of its groundwater aquifer system. Landforms around Del Rio include rolling hills. Most of the landscape features in the area have been the result of erosion caused by the Rio Grande and its tributaries (USACE 1994).

Section M-2A in Eagle Pass, Texas, is on the Balcones Escarpment of the Blackland Prairies which is the innermost section of the Gulf Coastal Plains. The blacklands have a gentle undulating surface where the majority of natural vegetation has been cleared to grow crops (University of Texas 2006).

Geology. The impact corridor lies on recent floodplain deposits adjacent to the Rio Grande. The soils are composed of sediments that include unconsolidated mixed gravel, sand, silt, and clay. The predominant rock types are mixed shales and sandstones. Some areas include bedrock along the channels of the Rio Grande. The landforms reflect the different rock types with the sandstones forming gentle hills and the shales forming valleys. The soils along the Del Rio Sector are subject to periodic flooding (NRCS 1982).

Section M-1 is underlain by hard limestone that is resistant to erosion. Val Verde County's surface geology is dominated by sedimentary rock derived from deposits of three geologic periods (NRCS 1982). Section M-2A is underlain by the Navarro and Taylor Groups of the Quaternary Period including undivided Quaternary materials.

Soils. Section M-1 will cross over three soil units. The soil units (Lagloria loam, Rio Grande silt loam, and Rio Grande soils) are derived from Rio Grande alluvium and are nearly level to sloping soils on floodplains and low terraces. The location for the Project lies primarily in Rio Grande soils and crosses over two excavation pits (see **Appendix D**).

Rio Grande soils (Ro) are deep, nearly level to gently sloping soils found on the bottom lands of the Rio Grande that are frequently flooded. Along the Del Rio Sector below Amistad Reservoir, these soils are flooded every 4 to 20 years when the floodgates are opened or from local runoff from nearby tributaries. Slopes range from 0 to 3 percent with an average of 1 percent. Mapped areas are long and parallel the Rio Grande. The surface layer is composed of silt loam, very fine sandy loam, loam, and very fine sand with no regular pattern. The surface layer is light brownish gray, very fine sandy loam about 8 inches thick. The underlying layer is light brownish gray. The Rio Grande soils are well–drained with slow surface runoff and are susceptible to erosion. Rio Grande soils are considered hydric soils. Hydric soils are defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper layer (NRCS 1982).

Lagloria loam (LaB) is a deep, nearly level to gently sloping soil found on the low terraces of the Rio Grande. Slopes average 0.3 percent. The surface layer is brown loam and the subsoil is light yellowish brown loam. The soil is moderately alkaline and calcareous throughout. The soil is well-drained and surface runoff is medium. This soil is susceptible to erosion (NRCS 1982).

The Rio Grande silt loam (Rg) is a deep, nearly level to gently sloping soil found on the bottom lands of the Rio Grande. The soil below the Amistad Reservoir is occasionally flooded when the floodgates are opened or from local runoff from nearby tributaries. However, the dam protects these soils from the majority of flood events. Slopes range from 0 to 3 percent. The surface layer is pale brown silt loam and the subsoil is light brownish gray loam. The soil is well-drained with slow surface runoff (NRCS 1982).

The Rio Grande silt loam is the only soil map unit listed as prime farmland. Prime farmland has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods (NRCS 2007). Although the soil type indicates it could be prime farmland, the area mapped as prime farmland is mostly located under the Del Rio POE. Therefore, no part of the impact corridor for Section M-1 is considered prime farmland.

The routes for Section M-2A will cross over four soil map units according to the Web Soil Survey. They are Copita sandy clay loam, Lagloria very fine sandy loam (0 to 1 percent slope), Lagloria very fine sandy loam (1 to 3 percent slope), and Rio Grande and Zalla soils, frequently flooded (NRCS 2007).

Rio Grande and Zalla soils (Rz) are found on the Rio Grande terrace adjacent to the river. These soils are flooded when sufficient water is released from Amistad Reservoir or from local runoff from nearby tributaries. Slopes range from 0 to 1 percent. The surface layer is 10 inches thick and is a very fine sandy loam while the subsoil (10 to 80 inches thick) is a stratified silt loam. The soil is well-drained to somewhat excessively drained (NRCS 2007).

The Copita sandy clay loam (CoB) forms linear bands in interfluves. The slope ranges from 1 to 3 percent. The surface soil layer and subsoil layer are both sandy clay loams. Between 20 and 40 inches, the soil reaches a restrictive paralithic bedrock layer. The soil is well-drained (NRCS 2007).

The Lagloria very fine sandy loam, 0 to 1 percent slope (LgA), forms linear bands on the upper reaches of the Rio Grande terrace. The slope ranges from 0 to 1 percent. The surface soil layer is very fine sandy loam and the subsoil layer is stratified silty clay loam. The Lagloria very fine sandy loam, 1 to 3 percent slope (LgB) has identical soil characteristics as LgA, but is found further from the Rio Grande on slight slopes (NRCS 2007). Both Lagloria very fine sandy loam soil types (LgA and LgB) are considered prime farmland when properly irrigated. However, the project area is not irrigated. Therefore, no part of the impact corridor for Section M-2A is considered prime farmland.

5.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Short- and long-term minor adverse impacts on the natural topography are expected. Grading, contouring, and trenching associated with the installation of the tactical infrastructure will impact approximately 55 acres for Section M-1 and approximately 6 acres for Section M-2A, which could result in minor alterations of the existing microtopography. The impact corridor will be regraded, contoured, and revegetated following tactical infrastructure installation. This will minimize modifications to existing flood-flow characteristics.

The Storm Water Pollution Prevention Plans (SWPPPs) should contain one or more site maps that show the construction site perimeter, existing and buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the impact corridor. The SWPPPs must list BMPs that the discharger will use to protect storm water runoff along with the locations of those BMPs. Additionally, the SWPPPs must contain a visual monitoring program, a chemical monitoring program for nonvisible pollutants to be implemented if there is a failure of BMPs, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Minor adverse impacts due to potential increased sheet flow as a result of grading, contouring, and trenching is expected to be temporary and mitigated by the implementation of the BMPs developed during preparation of the SWPPP.

Geology. Short- and long-term negligible to minor adverse impacts on geologic resources could occur at locations where bedrock is at the surface and blasting will be necessary to grade for fence placement or patrol road development. Geologic resources could affect the placement of the primary pedestrian fence or patrol roads due to the occurrence of bedrock at the surface, or as a result of structural instability. Site-specific geotechnical surveys will be conducted prior to construction to determine depth to bedrock. In most cases, it is expected that Project design and engineering practices could be implemented to mitigate geologic limitations to site development.

Soils. Short-term minor direct adverse impacts on soils are expected. Soil disturbance and compaction due to grading, contouring, and trenching associated with the installation of the tactical infrastructure sections will impact approximately 43 acres in Section M-1 and approximately 5 acres in Section M-2A. Short- and long-term minor to moderate adverse impacts are expected on approximately 3 acres for Section M-1 and approximately 1 acre for Section M-2A of the permanent soil disturbance as a result of grading, contouring, trenching, and compaction associated with the installation of the fence. The volume of soil disturbance cannot be determined due to the operational sensitivity of disclosing the exact depth of soil disturbance. However, displaced soil will be properly stockpiled to prevent erosion and sedimentation and excess soils will be disposed of properly if not utilized during regrading and recontouring activities following installation of the fence. In areas where soils have not been previously disturbed by development and other land uses prior to this Project, minor adverse effects on natural soil structure and soil organisms will be expected.

Increased soil erosion as a result of the construction activities will be minimized with the implementation of BMPs established during the development of the SWPPP. Implementing these BMPs will minimize adverse effects associated with sediments that could potentially be transported from construction sites and deposited in the Rio Grande. Construction activities expected to directly impact the existing soils as a result of grading, excavating, placement of fill, compaction, and mixing or augmentation necessary to prepare the sites for development of the fence sections and patrol roads and associated utility lines will also be avoided by the proper implementation of the BMPs. Due to the semi-arid climate of the region, wind erosion could potentially impact disturbed soils in areas where vegetation has been removed. However, following construction activities, the areas disturbed will be revegetated with native species to the maximum extent practicable to reestablish native plant communities and help stabilize soils.

Long-term minor direct adverse impacts on Rio Grande silt loam in Section M-1 and Lagloria soil types in Section M-2A, both designated prime farmland soils by the NRCS, will occur as a result of construction activities. The impact corridor will be linear and limited in extent, therefore any impacts on the areas considered prime farmland will be considered minor. Soils in open areas between the tactical infrastructure sections could be adversely impacted by cross-border violators in the areas where there will be no fence. However, changes to cross-border violator traffic patterns result from a myriad of factors in addition to USBP operations and therefore are considered unpredictable and beyond the scope of this ESP.

6. WATER USE AND QUALITY

6.1 HYDROLOGY AND GROUNDWATER

6.1.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Clean Water Act (CWA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CWA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for hydrology and groundwater.

Hydrology addresses the redistribution of water through the processes of evapotranspiration, surface runoff, and subsurface flow. Hydrology results primarily from temperature and total precipitation that determine evapotranspiration rates, topography which determines rate and direction of surface flow, and soil properties that determine the rate of subsurface flow and recharge to the groundwater reservoir. Groundwater consists of subsurface hydrologic resources. It is an essential resource that functions to recharge surface water and is used for drinking, irrigation, and industrial processes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, recharge rate, and surrounding geologic formations.

6.1.2 Affected Environment

The Project is in the Middle Rio Grande Valley Subbasin in the Rio Grande Basin. The Rio Grande Basin drains an area of more than 330,000 square miles in Colorado, New Mexico, and Texas in the United States and Chihuahua, Durango, Coahuila, Nuevo Leon, and Tamaulipas in Mexico. It is the international boundary between the United States and Mexico along the last 1,255 miles from the Colorado Rockies to the Gulf of Mexico. In Texas, the Rio Grande Basin drains an area of 86,720 square miles. Water development projects in the Middle Rio Grande Valley have disrupted natural flow regimes, including structures such as Falcon Dam and Amistad Dam. Substantial quantities of surface water are diverted from the Rio Grande to meet municipal, industrial, and agricultural demands in Texas and Mexico, with a significant portion used in the Middle Rio Grande Valley for farming and urban applications. The International Amistad Reservoir impounds water upstream of Del Rio and the release of water is based on allocation of water rights in the United States and Mexico (USIBWC 2003).

The northwestern portion of Section M-1 in Del Rio, Texas, starts at Cienegas Creek which is a tributary of the Rio Grande. The northwestern portion of

Section M-2A is adjacent to an arroyo. Both sections are parallel to the Rio Grande.

The City of Del Rio obtains water from both the Rio Grande and the Edwards-Trinity Aquifer. The land beneath the corridor for Section M-1 lies adjacent to the Rio Grande and does not recharge the Edwards-Trinity Aquifer. The City of Eagle Pass obtains its water exclusively from the Rio Grande. The depth to the water table for the soil map units for Sections M-1 and M-2A is more than 80 inches.

6.1.3 Direct and Indirect Effects of the Project

Short- and long-term negligible direct adverse effects on the hydrology of the Rio Grande will be expected to occur as a result of the grading and contouring associated with the Project. Grading and contouring will be expected to alter the topography and remove vegetation of approximately 49 acres within the floodplain of the Rio Grande, which could in turn increase erosion potential and increase runoff during heavy precipitation events. Revegetating the area following construction along with other BMPs to abate runoff and wind erosion could reduce the effects of erosion and runoff. Additionally, the small increase in impervious surface within the floodplain will result in negligible increases in the quantity and velocity of storm water flows to the Rio Grande. BMPs will be developed as part of the SWPPPs to manage storm water both during and after construction. Therefore, effects are expected to be negligible.

Short-term minor direct adverse construction-related effects on groundwater resources in Maverick and Val Verde counties will also be expected. During construction, water will be required for pouring concrete, watering of road and ground surfaces for dust suppression during construction, and for washing construction vehicles. Water use for construction will be temporary, and the volume of water used for construction will be minor when compared to the amount used annually in the area for municipal, agricultural, and industrial purposes. The source for this water is currently unknown; prior to construction a water source with a current allocation will be identified. The potential for short–term negligible adverse effects on groundwater related to an increase in storm water runoff will also occur. Implementation of storm water and spill prevention BMPs developed consistent with the SWPPPs and other applicable plans will minimize potential runoff or spill-related impacts on groundwater quality during construction. Development of spill prevention practices as part of the SWPPP will minimize potential for adverse effects on groundwater quality resulting from spills or leakage from construction equipment.

6.2 SURFACE WATERS AND WATERS OF THE UNITED STATES

6.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the CWA, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CWA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for surface waters and waters of the United States.

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale.

Waters of the United States are defined in 33 CFR 328.3. Navigable waters are defined in 33 CFR 329.4. USEPA and the USACE assert jurisdiction over (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) nonnavigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-around or have continuous flow at least seasonally, and (4) wetlands that directly abut such tributaries. In addition, the Supreme Court issued a decision on June 19, 2006, under Rapanos versus the United States (Rapanos Decision), limiting the scope of the CWA jurisdiction over isolated waters of the United States, including wetlands. On June 5, 2007, USEPA and the USACE issued joint guidance clarifying CWA jurisdiction in light of the Rapanos Decision.

Wetlands and riparian habitats represent some of the most ecologically important and rare vegetation communities on desert landscapes. They provide keystone habitat for a wide array of plant and animal species including resident and migrating birds, amphibian and fish species, mammals, and insects. Vegetation production and diversity are usually very high in and around these mesic to aquatic sites, with many plant species adapted only to these unique environments. In addition, wetlands and riparian zones provide a variety of hydrologic functions vital to ecosystem integrity. These include water filtration of sediment, groundwater recharge, and nutrient/chemical capture (USFWS 1995). Development and conversion of wetlands and riparian zones affect wildlife diversity, carrying capacity, and hydrologic regime. Changes to and removal of wetlands can cause effects that are proportionally greater than elsewhere in an ecosystem (Graber 1996).

Wetlands have been defined by agencies responsible for their management. The term "wetland" used herein, is defined using USACE conventions. The USACE has jurisdiction to protect wetlands under Section 404 of the CWA using the following definition:

> . . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands have three diagnostic characteristics that include: (1) over 50 percent of the dominant species present must be classified as obligate, facultative wetland, or facultative, (2) the soils must be classified as hydric, and (3) the area is either permanently or seasonally inundated, or saturated to the surface at some time during the growing season of the prevalent vegetation (USACE 1987).

Wetlands are protected as a subset of "the waters of the United States" under Section 404 of the CWA. The term "waters of the United States" has a broad meaning under the CWA and incorporates deepwater aquatic habitats and special aquatic habitats (including wetlands).

6.2.2 Affected Environment

Surface Water

Surface Waters and Other Waters of the United States. Surface water and wash features in the impact corridor include the Rio Grande, Cienegas Creek, washes (arroyos), drainage channels, and wetlands. The northwestern section of Section M-1 starts at Cienegas Creek which is a tributary of the Rio Grande. The northwestern section of Section M-2A is adjacent to a wash. Both sections of tactical infrastructure will parallel the Rio Grande. According to a reconnaissance survey conducted in November 2007, wetlands were identified along the eastern end of Section M-1 based on vegetation and hydrology (see **Appendix E**).

Wetland indicator species are listed in **Appendix E** and include the following vegetation associations: sugarberry (*Celtis laevigata*) riparian woodland and giant reed (*Arundo donax*) herbaceous vegetation. The sugarberry riparian woodland is a rare vegetation association found in narrow bands on the outer floodplain margin of the Rio Grande and the banks of Cienegas Creek within Section M-2A. Dense *Arundo donax* stands were observed in association with Rio Grande floodplain terraces, floodplains of tributary drainages, and ditch banks of Sections M-1 and M-2A. The locations of potential wetlands identified during the November 2007 natural resources survey are presented in **Appendix E**.

Jurisdictional Wetlands and Other Waters of the United States within the Project Areas. Field surveys were conducted in Sections M-1 and M-2A on January 31 and February 1, 2008, to delineate jurisdictional wetlands and other waters of the United States within project areas. Delineations were also conducted along planned access roads and staging areas associated with the fence alignments. Formal delineations were conducted within a 150-foot-corridor associated with the fence alignments, 60 feet to either side of planned access roads, and within staging areas.

Determination of the occurrence and extent of jurisdictional wetlands and other waters of the United States was based on the application of procedures established in the USACE *Wetlands Delineation Manual*, Technical Report Y–87–1 (USACE 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region,* Technical Report ERDC/EL TR-06-16 (USACE 2006). Determination of the occurrence of jurisdictional wetlands was based on the presence or absence of hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology. The presence of all three of the criteria is necessary for an area to be designated as a jurisdictional wetland under normal conditions.

Determination of the extent of jurisdictional washes (arroyos) and other waters of the United States in the project areas was based on characterization of the landward extent of the ordinary high water mark (OHM). Indicators used to determine the occurrence and extent of jurisdictional washes included the presence of developed channels, typically 2 feet or greater in width; the occurrence of an OHM; the absence of fine sediments along flow paths; distinct changes in the vegetative assemblage or larger or more dense vegetation than surrounding areas; the presence of cut banks; the presence of litter, debris, or rack lines; occurrence of desiccation cracks or other indicators of hydrology; and other indicators of the occurrence of intermittent water flow regimes.

Table 6-1 provides the section locations, wetland or other waters of the United States types, total acreages delineated, and the acreage of each identified wetland or other waters of the United States within the 60-foot potential impact area. Maps showing the locations and boundaries of delineated wetlands and other waters of the United States in the Project assessment areas are provided in **Appendix E**.

Based on the field surveys, three wetlands or other waters of the United States (WL7, WL8, and WL9) were identified in Section M-1, five wetlands or other waters of the United States (WL1 through WL5) occur within the assessment area in Section M-2A, and one water of the United States (WL6) was identified outside of the project areas to the south of Section M-1. General characteristics of wetlands or other waters of the United States identified during the January 31 and February 01, 2008, field surveys are described in the following text. Wetlands and other waters of the United States are described in numeric progression, which reflects the order in which they were delineated in the field.

Table 6-1. Wetlands and Other Waters of the United States within the 60-Foot Potential Impact Areas

Wetland or Other Waters of the United States Identification	Section	Wetland or Other Waters of the United States Type	Total Acreage Delineated	Acreage within the 60-Foot Potential Impact Area
WL 1	M-2A	Riverine – Rio Grande River	1.09 acres	0.00 acres
WL 2	M-2A	Drainage channel	0.018 acres	0.018 acres
WL 3	M-2A	Drainage channel	0.03 acres	0.03 acres
WL 4	M-2A	Riverine/palustrine emergent	0.23 acres	0.19 acres
WL 5	M-2A	Palustrine emergent	0.37 acres	0.29 acres
WL 6	Outside of fence Sections M-1 and M-2A	Hardened stream channel	0.67 acres	0.00 acres
WL 7	M-1	Wash	0.09 acres	0.00 acres
WL 8	M-1	Wash	0.06 acres	0.03 acres
WL 9	M-1	Palustrine emergent	0.75 acres	0.00 acres

- WL1 (Section M-2A) is the Rio Grande. The Rio Grande borders Section M-2A on its western side in the project area. Dense stands of *Arundo donax* occur in association with the banks of the Rio Grande in the project area.
- WL2 (Section M-2A) is a deeply incised drainage channel that conveys ephemeral flows down a bluff and directly into the Rio Grande. The channel ends approximately 150 feet east of the existing road that parallels the Rio Grande (180 feet from Rio Grande). The channel ends in the back yards of a housing development that borders the bluff. The channel discharges to the Rio Grande approximately 30 feet west of the existing access road. The channel width at base is approximately 2 feet. The vegetation or soils do not meet the criteria in the 1987 manual for WL2 to be classified as a vegetated wetland. WL2 encompasses 0.018 acres within the project area.
- WL3 (Section M-2A) is a wide drainage channel that conveys ephemeral flows down a bluff and directly into the Rio Grande. The channel ends approximately 100 feet east of the existing road that parallels the Rio Grande (120 feet from the Rio Grande). The channel ends in the back

yards of a housing development that borders the bluff. The channel discharges to the Rio Grande approximately 20 feet west of the existing access road. The channel width at base is approximately 10 feet. The vegetation or soils do not meet the criteria in the 1987 manual for WL3 to be classified as a vegetated wetland. WL3 encompasses 0.03 acres within the project area.

- WL4 (Section M-2A) is riverine/palustrine emergent wetland with perennial flows. The wetland, which receives flows from the adjacent city water treatment plant to the east, flows via culvert under the existing access road that parallels the Rio Grande and then for approximately 100 feet to the west and into the Rio Grande. The wetland occurs both within the drainage channel and on and adjacent to the channel banks. Vegetation in the wetland is characterized by a near monotypic stand of *Aruno donax*. WL4 encompasses 0.19 acres within the project area.
- WL5 (Section M-2A) is a palustrine emergent wetland bordering a drainage channel. The wetland drains from east to west under an existing bridge towards the Rio Grande approximately 500 feet west of the bridge. The wetland occurs both within the drainage channel and on and adjacent to its banks. Vegetation in the wetland is characterized by a near monotypic stand of *Aruno donax* with some *Salix nigra* near the wetland boundary. WL5 encompasses 0.29 acres within the project area.
- WL6 is an unnamed stream channel that has been hardened with concrete. The channel width at base is approximately 20 feet. WL6 is outside of the impact corridors.
- WL7 (Section M-1) is a palustrine emergent wetland immediately abutting Cienegas Creek approximately 100 feet upstream of its confluence with the Rio Grande. WL7 is on the banks of Cienegas Creek and receives overbank flows from the creek. Hydrology in the wetland is also driven by a high groundwater table associated with the creek. Vegetation in the wetland is characterized by *Scirpus americanus, Andropogon glomeratus*, and *Arundo donax* with some *Baccharis salicifolia* occurring near its upland boundary. WL7 encompasses 0.034 acres within the project area.
- WL8 (Section M-1) in the project area is at the current headwater end of an ephemeral drainage that drains to the south towards the Rio Grande. The Rio Grande is approximately 2,000 feet to the south of the project area. The drainage in the project area conveys storm water flows via a box culvert under Frontera Road and then into a channel on the south side of the road. The channel has head cut up to the box culvert under Frontera Road and the culvert has been undercut by storm water flows. The channel width at base just downstream of Frontera Road is approximately 10 feet. The vegetation or soils in the project area do not meet the criteria in the 1987 manual for WL8 to be classified as a wetland. The drainage channel to the south of the project area is vegetated with *Arundo donax*. WL8 encompasses 0.27 acres within the project area.

- WL9 (Section M-1) is a palustrine emergent wetland that drains to the southwest towards the Rio Grande. The Rio Grande is approximately 2,000 feet to the southwest of WL9. The northern boundary of WL9 is just south of the planned fence alignment and project area, but was delineated due to its proximity to the alignment. Several springs and seeps drain into the wetland along its northern boundary. Vegetation in the wetland is characterized by near monotypic *Aundo donax* with some *Salix nigra*. Minor *Baccharis salicifolia* also occurs near the upland boundary. Abundant household trash (e.g., shoes, clothes) has been dumped along the northern boundary of the wetland. The wetland was inundated up to the wetland/upland boundary at the time of the field survey. WL9 encompasses 0.75 acres within the project area.

Surface Water Quality. The Rio Grande is used for drinking water, irrigation, and recreation. The water quality in the Middle Rio Grande Valley Subbasin is better than other sections of the Rio Grande drainage (USIBWC 2003). The primary concern for the area is the high levels of bacteria and nutrient loading. The increases are found below return drains and tributaries where wastewater discharges enter the Rio Grande. Cities along the Rio Grande, including Del Rio and Eagle Pass and their sister cities in Mexico, Ciudad Acuña and Piedras Negras, are addressing the issue by constructing or upgrading wastewater treatment facilities (USIBWC 2003).

Water tested upstream of the SR 277 bridge in Del Rio had high levels of phosphorus, although these levels had decreased during the sampling period. Water tested 4.5 miles downstream of Del Rio, Texas, at Moody Ranch had increased levels of fecal coliform bacteria. Similar trends are observed for water sampled upstream and downstream of Eagle Pass where bacteria levels increased above the surface water standard for water that has passed through the City of Eagle Pass (USIBWC 2003). The waters downstream of Amistad Dam (Segment 2304 of the Rio Grande, 12 miles northwest of Del Rio) was identified on the State of Texas 1999 CWA § 303(d) lists as “not supporting” aquatic life uses due to toxicity of ambient water downstream of Del Rio and was retained in the draft 2000 1999 CWA § 303(d) list and due to insufficient data available in 2002 to assess water quality was identified on the 2002 list. However, testing in 2003 revealed no lethal toxicity to fish and minimal levels of sublethal toxicity to invertebrates. It was determined that aquatic life uses were not impaired due to toxicity and it was recommended that this segment of the Rio Grande be removed from the 303(d) list and also indicated the development of a total maximum daily load (TMDL) will be impractical due to inconsistent evidence of sublethal toxic effects not positively linked to a source in Texas (TCEQ 2003).

6.2.3 Direct and Indirect Effects of the Project

Minor short- and long-term impacts on wetlands and washes in Section M-2A are expected. Section M-2A parallels the Rio Grande adjacent to its eastern bank. In addition, the alignment crosses two ephemeral drainages (WL2 and WL3), wetland WL4 and wash WL5. A patrol road currently exists along the entire alignment of Section M-2A, but will likely require some upgrade. A bridge currently exists where the patrol road crosses WL5. The bridge will not likely require any upgrade. Placement of tactical infrastructure adjacent or within wetlands and across drainages and the wash channel will result in potential short-term effects on the wetlands, drainages, and wash as a result of land disturbance and associated erosion and sedimentation. Erosion and sediment controls and storm water management practices (discussed below) will be implemented during construction to minimize potential for adverse effects on wetlands adjacent to the tactical infrastructure alignment and to the drainages and wash crossed by the alignment. Long-term effects will occur as a result of the placement of fill associated with construction of the fence and upgrades to existing patrol roads. Impacts on the wetlands and washes will be avoided to the maximum extent practicable. Minor short- and long-term impacts on wetlands and washes in Section M-1 will be expected. The tactical infrastructure alignment for Section M-1 starts on its north end at Cienegas Creek and associated WL7. The alignment crosses one ephemeral drainage (WL8) in its central section, then passes just north of the northern boundary of an emergent wetland (WL9) near the southern end of the alignment. Placement of tactical infrastructure adjacent to, or within wetlands and across the ephemeral drainage could result in potential short-term impacts on the wetlands and the drainage as a result of land disturbance and associated erosion and sedimentation. Erosion and sediment controls and storm water management practices (discussed below) will be implemented during construction to minimize potential for adverse effects on wetlands adjacent to the tactical infrastructure alignment and the ephemeral drainage crossed by the alignment. Long-term effects will occur as a result of the placement of fill associated with construction of the fence. Impacts on the wetlands and ephemeral drainage will be avoided to the maximum extent practicable.

Under the Project, as a component of tactical infrastructure development in Section M-1, CBP plans to clear vegetation from an approximate 36-acre area west of the Del Rio POE. Wetlands and other waters of the United States within the project area have not been delineated to date. Prior to conducting any clearing within this area, a field delineation will be conducted. All jurisdictional wetlands and other waters of the United States occurring within the clearing area will be avoided, so no impacts on jurisdictional wetlands and other waters of the United States are to be expected.

Implementation of the Project will be expected to have minor short-term adverse effects on surface water quality as a result of potential erosion and associated transport of sediments into adjacent surface waters. Development of an SWPPP will aid in controlling water pollution, and will require designing BMPs, including erosion and sediment controls, that the discharger will use to protect storm water runoff.

Adverse effects on jurisdictional wetlands, washes, and other waters of the United States will be avoided and minimized to the maximum extent practicable. Appropriate mitigation will be developed to compensate for unavoidable impacts. As a result, impacts on wetlands and other waters of the United States associated with implementation of the Project are expected to be minor.

6.3 FLOODPLAINS

6.3.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the CWA, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the CWA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for floodplains.

Floodplains are areas of low-level ground and alluvium adjacent to rivers, stream channels, or coastal waters. The living and nonliving parts of natural floodplains interact with each other to create dynamic systems in which each component helps to maintain the characteristics of the environment that supports it. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and a diversity of plants and animals. Floodplains provide a broad area to spread out and temporarily store floodwaters. This reduces flood peaks and velocities and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body (FEMA 1986).

Floodplains are subject to periodic or infrequent inundation due to runoff of rain or melting snow. Risk of flooding typically hinges on local topography, the frequency of precipitation events, and the size of the watershed upstream from the floodplain. Flood potential is evaluated by Federal Emergency Management Agency (FEMA), which defines the 100-year floodplain. The 100-year floodplain is the area that has a 1 percent chance of inundation by a flood event in a given year. Certain facilities inherently pose too great a risk to be constructed in either the 100- or 500-year floodplain, including hospitals, schools, or storage buildings for irreplaceable records. Federal, state, and local regulations often limit floodplain development to passive uses, such as recreational and preservation activities, to reduce the risks to human health and safety.

6.3.2 Affected Environment

Section M-1 is mapped in Zone A (100-year floodplain). No Base Flood Elevations or depths are shown on the FIRM (FEMA undated). In addition to FEMA mapping, detailed hydraulic studies have determined base flood elevations. Site-specific surveys have determined that the Project is in the FEMA 100-year floodplain, but not in the USIBWC floodplain (see **Figure 1-1**).

Section M-2A occurs in FEMA FIRM Panel No. 4804710004C for Eagle Pass, Texas, effective October 19, 2005. The section is mapped in Zone AE which lies in the 100-year floodplain of the Rio Grande.

6.3.3 Direct and Indirect Effects of the Project

Effects on floodplains will be avoided to the maximum extent practicable. Potential short- and long-term minor adverse effects on the Rio Grande floodplain in Sections M-1 and M-2A will occur as a result of construction activities associated with the Project. Approximately 43 acres in Section M-1 and approximately 5 acres in Section M-2A of the FEMA 100-year floodplain will be affected. Placement of the primary pedestrian fence and removal of vegetation in Sections M-1 and M-2A will increase the volume and velocity of sheet flow and runoff in the floodplain.

Erosion and sediment control and storm water management practices during and after construction will be implemented consistent with the SWPPP. Based on this plan, adverse effects on floodplain resources will be minimized.

A primary pedestrian fence within the floodplain could affect flood flows if blockages to flow following high flow events are not removed. The primary pedestrian fence will be constructed parallel to the high flow contours to the maximum extent practicable. Periodic maintenance of the primary pedestrian fence to remove debris will minimize the potential for it to modify flood flows.

Hydraulic modeling indicates that no impacts on the USIBWC international floodplain will be expected for Section M-1. Hydraulic modeling will be conducted to determine if Section M-2A will have an impact on the USIBWC international floodplain.

CBP has determined that Sections M-1 and M-2A cannot be practicably located outside the floodplain since the current floodplain extends inland past local communities and roads strategic to the operations of USBP. CBP will mitigate unavoidable impacts associated with floodplains using planning guidance developed by the USACE. Properly designed erosion and sediment controls and storm water management practices will be implemented to minimize potential for adverse impacts.

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7. BIOLOGICAL RESOURCES

7.1 VEGETATION

7.1.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations associated with vegetation resources.

Vegetation resources include native or naturalized plants and serve as habitat for a variety of animal species. Wetlands are discussed in **Chapter 6**. This section describes the affected environment for native and nonnative vegetation followed by potential impacts on those resources from the Project. This analysis is based on site surveys conducted in September and October 2007. More detailed information on vegetation resources, including vegetation classification, species observed, and the survey methodology is contained in the Biological Survey Report (see **Appendix E**). CBP also worked closely with the USFWS to develop the Biological Resources Plan (see **Appendix F**).

7.1.2 Affected Environment

The vegetation near Del Rio and Eagle Pass has been classified as Dry Domain (300), Tropical/Subtropical Steppe Division (310) (Bailey 1995). The impact corridor is more finely classified as the Southwestern Plateau and Plains Dry Steppe and Shrub Province (315). The Texas Parks and Wildlife Department (TPWD) provides discussion and describes vegetation geography of biotic provinces and natural regions using topographic features, climate, vegetation types, and terrestrial vertebrates. This system places the impact corridor in the Tamaulipan Biotic Province, South Texas Brush Country (Rio Grande Basin) Natural Region, Brush Country Sub-region, and the Level III Ecoregion of the Southern Texas Plains. The climate for the area is generally considered semi arid continental (NOAA 2007) and has been further described as subtropical steppe within the Modified Marine climatic type (e.g., summers are long and hot and winters are short, dry, and mild) (Larkin and Bomar 1983, Bailey 1995). A long growing season of approximately 300 days is experienced for the area.

Tamaulipan Brushland represents a unique ecosystem (USFWS 1988). The characteristic natural vegetation is dense and thorny, and plant species distribution can be correlated with geologic formations. The Rio Grande floodplain supports tall, dense riparian forest, woodland, shrubland, and herbaceous vegetation while the xeric upland areas support mostly spiny shrubs, short-stature trees, and dense nonnative grasslands. Between the 1920s and

1980s, more than 95 percent of the native brushland and 90 percent of the riparian vegetation had been converted to agriculture and urban land use (USFWS 1988). In 1988, it was estimated that 98 percent of the lush, subtropical region of the Rio Grande Valley had been cleared of native vegetation in the United States and a large but unknown percentage cleared in Mexico. This chapter describes and illustrates the existing condition and distribution of vegetation as it occurred in the 2007 Biological Survey Report (see **Appendix E**) within Sections M-1 and M-2A.

In general, the vegetation of Sections M-1 and M-2A consists of small stands of native sugarberry, black willow, granjeno, huisache, and honey mesquite woodlands; honey mesquite and retama shrublands regrowing from nonnative Bermuda grass pastures; and nonnative Bermuda grass, giant reed, and Russian-thistle stands. Some agriculture, mostly pastures of Bermuda grass, occur along the northeastern side of Garza Lane of Section M-1. Emergent and forested wetland communities (identified by type in **Chapter 6.2.2**) occur rarely within the corridor in seep and spring sites and giant reed wetland stands are common; Project-related effects on wetlands are presented in **Chapter 6.2.3**.

7.1.3 Direct and Indirect Effects of the Project

The impact corridor will include approximately 43.3 acres of vegetation removal for Section M-1 and approximately 5.4 acres of vegetation removal for Section M-2A. Construction grading for this Project will result in approximately 49 acres of direct, adverse impacts on vegetation. Vegetation clearing and removal within this section will result in moderate short- and long-term adverse effects on strips and patches of sugarberry, granjeno, and honey mesquite woodland; honey mesquite and retama shrubland; Bermuda grassland; Russian-thistle forbland; and giant reed communities. The 150-foot corridor in Section M-1 will also be maintained clear of giant reed and other woodland, shrubland, and other grassland vegetation. Dust generated from vehicles on access roads will result in negligible to minor, short- and long-term adverse effects on downwind vegetation due to interference with pollination and photosynthesis.

The fencing is expected to provide protection for vegetation in the areas north of the tactical infrastructure from foot traffic impacts by cross–border violators. However, changes to cross-border violator traffic patterns result from a myriad of factors in addition to USBP operations and therefore are considered unpredictable and beyond the scope of this ESP.

7.2 WILDLIFE AND AQUATIC SPECIES

7.2.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts and mitigations on wildlife and aquatic resources.

Wildlife and aquatic resources are native or naturalized animals, including migratory birds, and the habitats in which they exist. Federal- and state-listed species and designated critical habitats are discussed in further detail in **Chapter 7.3.**

This analysis is based on site surveys conducted in September and October 2007. More detailed information on wildlife and aquatic resources, including species observed and the survey methodology is contained in the Biological Survey Report in **Appendix E**.

7.2.2 Affected Environment

***Wildlife*.** Sections M-1 and M-2A of the Project are in the South Texas Brush Country Natural Region within the Tamaulipan Biotic Province, in a transition zone with the Chihuahuan Biotic Province boundary a few miles northwest and the Balconian Biotic Province boundary a few miles north. Wildlife species from all three biotic provinces are likely to frequent the impact corridor. Both sections border the Rio Grande. Additionally, the Rio Grande is a major migratory flyway for numerous bird species, particularly waterfowl, shore birds, and those associated with riparian habitats.

The Chihuahuan Biotic Province includes the northwestern region of Texas that borders Mexico. The antelope (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) are the most widely distributed large game animals. The collared peccary or javelina (*Pecari tajacu*) is common in the southern part of the region. The blacktail jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), kangaroo rat (*Dipodomys* spp.), wood rat (*Neotoma floridana*), and numerous smaller rodents compete with domestic and wild herbivores for available forage. Mammalian predators include the coyote (*Canis latrans*) and bobcat (*Lynx rufus*). The black-throated sparrow (*Amphispiza bilineata*) is one of the most abundant birds of the province. Greater roadrunner (*Geococcyx californianus*), curve-billed thrasher (*Toxostoma curvirostre*), and Chihuahuan raven (*Corvus cryptoleucus*) are also common. Scaled quail (*Callipepla squamata*) and Gambel’s quail (*Callipepla gambelii*) occupy most of the area, and northern bobwhite (*Colinus virginianus*) populations reach into its eastern portion. Raptors include the golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), and the rare zone-tailed hawk (*Buteo albonotatus*). The many reptiles include the common chuckwalla (*Sauromalus ater*), Texas horned lizard (*Phrynosoma cornutum*), desert spiny lizard (*Sceloporus magister*), and various species of rattlesnakes (*Crotalus* spp.) (Bailey 1995).

The Balconian Biotic Province includes the Edwards Plateau north of the USBP Del Rio Sector. The Mexican ground squirrel (*Spermophilus mexicanus*) and gray fox (*Urocyon cinereoargenteus*) are found in this province. Whitetail deer (*Odocoileus virginianus*) are abundant, and nine-banded armadillo (*Dasypus novemcinctus*) are present. The fox squirrel (*Sciurus niger*) is hunted in wooded areas along streams. Chief furbearers are the ringtail (*Bassariscus astutus*) and raccoon (*Procyon lotor*). Wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), scaled quail, and bobwhite are common game birds, and several species of hawks and owls are present (Bailey 1995).

The Tamaulipan Biotic Province includes a variety of wildlife species. Common species of amphibians in the region include spadefoot toads (*Scaphiopus* spp.), chorus frogs (*Pseudacris* spp.), true toads (*Bufo* spp.), and true frogs (*Rana* spp.). Common snakes include rat snakes (*Elaphe* spp.), water snakes (*Nerodia* spp.), western diamondback rattlesnakes (*Crotalus atrox*), and Texas coral snakes (*Micrurus fulviustener*). Common turtles in the region include eastern river cooter (*Pseudemys concinna*), ornate box turtle (*Terrapene ornata*), yellow mud turtle (*Kinosternon flavescens*), Texas tortoise (*Gopherus berlandieri*), smooth softshell (*Apalone mutica*), and spiny softshell (*A. spinifera*). Mammal species likely to occur within or near the project area include coyote (*Canis latrans*), raccoon (*Procyon lotor*), cottontail (*Sylvilagus floridanus*), eastern fox squirrel (*Sciurus niger*), bobcat (*Lynx rufus*), and the nine-banded armadillo (*Dasypus novemcinctus*) (CBP 2007).

During a November 2007 survey, habitats observed within the impact corridor were native and nonnative woodlands, desert shrublands, riparian communities, and nonnative pastures and forblands (see **Chapter 7.1**). The riparian community is dominated by giant reed along the banks and undeveloped natural floodplains of the Rio Grande. Giant reed has become highly invasive, colonizing vast areas of riparian zones and displacing native vegetation along the Rio Grande and its tributaries. Because the impact corridor lies adjacent to densely populated urban areas, the riparian habitat could be used as a corridor for some wildlife species to travel through to less-disturbed habitat (CBP 2007). Wildlife species observed during the survey are presented in **Table 7-1**. During the survey 3 invertebrates, 1 reptile species, 2 amphibian species, 1 mammal species, and 21 bird species were recorded.

Aquatic Resources. The aquatic ecosystems are restricted to the Rio Grande and the tributaries that flow into the Rio Grande. In the Rio Grande, the dominant fish species include alligator gar (*Lepisosteus spatula*), thread-fin shad (*Dorosoma petenense*), common carp (*Cyprinus carpio*), bullhead minnow (*Pimephales vigilax*), striped bass (*Roccus saxatilus*), and Rio Grande perch (*Cichlasoma cyanoguttatum*) (CBP 2007).

Table 7-1. Wildlife Species Observed in November 2007 Survey

Common Name	Scientific Name	Species Status	M-1	M-2A
Insects				
Cloudless sulfur	*Phoebis sennae eubule*	C	X	
Monarch butterfly	*Danaus plexippus*	C	X	
Painted lady butterfly	*Vanessa cardui*	C	X	
Amphibians				
Bullfrog	*Rana catesbiena*	C	X	
Rio Grande leopard frog	*Rana berlandieri*	C	X	
Reptiles				
Indigo snake	*Drymarchon corais*	ST	X	
Birds				
Baltimore oriole	*Icterus galbula*	C	X	X
Barn swallow	*Riparia riparia*	C		X
Black-bellied whistling duck	*Dendrocygna autumnalis*	C	X	
Bufflehead	*Bucephala albeola*	C	X	
Couch's kingbird	*Tyrannus couchii*	C	X	X
Double-crested cormorant	*Phalacrocorax auritus*	C	X	
Gadwall	*Anas Strepera*	C	X	
Great egret	*Ardea alba*	C		X
Great-tailed grackle	*Quiscalus mexicanus*	C	X	X
Inca dove	*Columbina inca*	C		X
Kingfisher	*Megaceryle sp.*	C	X	
Mallard	*Anas platyrhynchos*	C	X	
Mourning dove	*Zenaida macroura*	C	X	
Northern cardinal	*Cardinalis cardinalis*	C	X	
Northern shoveler	*Anas clypeata*	C	X	
Red-shouldered hawk	*Buteo lineatus*	C	X	
Says phoebe	*Sayornis saya*	C		X
Scissor-tailed flycatcher	*Tyrannus forticatus*	C		X
Sparrow	*Spizella sp.*	C	X	X
Vermilion flycatcher	*Pyrocephalus rubinus*	C		X
Wild turkey	*Meleagris gallopavo*	C	X	
Mammals				
Raccoon	*Procyon lotor*	C		X

Notes: ST = State Threatened; C = Common

7.2.3 Direct and Indirect Effects of the Project

Wildlife. Potential threats to wildlife along the Rio Grande in the Del Rio Sector include barrier to movement, interruption of corridors, increased human activity, impacts of lights on nocturnal species, and loss of habitat. Some wildlife deaths, particularly reptiles and amphibians, could increase due to the improved accessibility of the area and increased vehicle traffic. Although some deaths might occur due to vehicular traffic, the road proximal to the fence will not be traveled at highway or even city street speeds under normal patrol conditions, providing better opportunity for wildlife to avoid collisions. As such, it is not anticipated that wildlife populations within the impact corridor will be affected by road-based mortality through the implementation of the Project.

Noise created during construction will be anticipated to result in short-term, moderate, adverse effects on wildlife, particularly birds and mid- to large-sized mammals. Noise levels after construction are anticipated to return to close to current ambient levels. Elevated noise levels during construction could result in reduced communication ranges, interference with predator/prey interactions, or habitat avoidance. More intense effects, potentially resulting with intense pulses of noise associated with blasting, could include behavioral change, disorientation, or hearing loss. Predictors of wildlife response to noise include noise type (i.e., continuous or intermittent), prior experience with noise, proximity to a noise source, stage in the breeding cycle, activity, and age. Prior experience with noise is the most important factor in the response of wildlife to noise, because wildlife can become accustomed (or habituate) to the noise. The rate of habituation to short-term construction is not known, but it is anticipated that wildlife will be permanently displaced from the areas where the habitat is cleared and the primary pedestrian fence and associated tactical infrastructure constructed, and temporarily dispersed from areas adjacent to the project areas during construction periods. See **Chapter 3** for additional details on expected noise levels associated with the Project.

The approximate 49 acres of vegetation that will be removed are dominated by sugarberry, granjeno, and honey mesquite woodlands; honey mesquite and retama shrublands; giant reed wetlands; and nonnative grasslands and forblands. This vegetation removal will result in short- and long-term, minor adverse effects on wildlife due to habitat conversion.

The fencing is expected to provide protection for wildlife and wildlife habitats in the areas north of the tactical infrastructure from foot traffic impacts by cross–border violators. However, changes to cross-border violator traffic patterns result from a myriad of factors in addition to USBP operations and therefore are considered unpredictable and beyond the scope of this ESP.

Reduction in habitat connectivity resulting from implementation of the Project will likely impact wildlife movement, access to traditional water sources, and potential for gene flow. Smaller, less-mobile species might be more heavily impacted than larger species. However, smaller species will also be able to fit through the bollard-style fence planned for much of the fence sections. Although larger species, such as ungulates and carnivores, might not be able to pass through the fence, such species tend to be more mobile, have larger home ranges, and will be able to move between fence sections. Although there is the potential to impact migratory birds during the actual construction, it is not anticipated that migratory birds will be affected by the presence of the fence given their mobility. The open area created along the impact corridor might serve to discourage movement across it for more brush- or woodland-specific species. However, the distance such species will have to traverse will be small relative to highways, towns, and other types of less-suitable habitat and it is anticipated that they could make the passage. The need for USBP pursuit and apprehension activities, which could serve to discourage passage by migratory bird and other wildlife movements, is expected to be reduced with the fence in place. As such, the impacts on wildlife movement are anticipated to be long-term, negligible to minor depending upon the species, and adverse.

In parallel with the impacts on wildlife movement anticipated for implementation of the Project, this route could cause some individuals of wildlife species to search for alternative water sources. However, alternative water sources are available and this impact will be only negligible and adverse over both the short and long terms.

Finally, because the number of successful dispersals required to maintain genetic diversity is small, any restriction of wildlife movement resulting from the Project is not anticipated to noticeably impact genetic diversity of most wildlife species. Hence the impact of the Project on population genetic structure of wildlife species in general is anticipated to be long-term, negligible, and adverse.

Lights along the impact corridor could behaviorally exclude nocturnal wildlife such as the bobcat from the illuminated zone, although potential use of these areas by bobcat is likely minimal given their proximity to urban development. Lights will be anticipated to have only minor adverse impacts on nocturnal wildlife depending on the species examined. Potential impacts of lights on ocelot and jaguarundi are addressed in **Chapter 7.3.3**.

CBP has included plans to use lighting, cameras, and other technology to support its efforts. Lighting an area will have an effect on the behaviors of diurnal and nocturnal species, and likely a direct or indirect effect on crepuscular species in the area. The height of the lights, direction of lighting, power source, and wattage will be assessed by USFWS prior to installation and use. Lights will operate from dusk to dawn. Light poles adjacent to USIBWC levees will be coordinated with and approved by the USIBWC. The final placement and direction of lighting has been and will continue to be coordinated with the USFWS. USBP has used lighting and other means for several years in many sectors along the U.S./Mexico international border. In general, the following methods can be used when lighting an area so that it has the least effect on wildlife:

- Producing a certain type of light (e.g., using low pressure sodium lighting)
- Establishing the height of the lamp based on the height of surrounding vegetation
- Providing high-intensity light shields on the top and sides of the light
- Using the least intensive lighting necessary for an area.

Artificial lighting will influence the behavior of most species, including mammals, birds, and amphibians. These behavior changes have been observed as changes in foraging patterns, the location of nesting sites, territorial singing, and migration routes. Other influences that might occur include disorientation, an attraction to artificial lighting, increased predation or prey, and an overall change to the ecological structure of an area. A comparison of lighting sources provides a better understanding (see **Table 7-2**).

Table 7-2. Light Source Intensity

Source	Illumination (lux)
Full sunlight	103,000
Cloudy day	1,000-10,000
Most homes	100-300
Lighted parking lot	10
Full moon under clear conditions	0.1-0.3
Clear starry night	0.001

Source: Rich and Longcore 2006

Many factors contribute to the analysis of lighting effects, including ambient conditions, the intensity of surrounding urban lighting, lighting intensity, and weather conditions, to name a few. The following are effects of artificial lighting on wildlife found in various studies conducted by researchers:

- Many usually diurnal birds and reptiles have been found to forage under (and become dependent upon) artificial lighting.
- The northern mockingbird (*Mimus polyglottos*) male typically sings at night before mating, yet under the effect of artificial lighting was found to sing only at night after mating had occurred. Other behavior changes were unknown.
- Nocturnally migrating birds have been disoriented by artificial lighting.
- Nest sites were observed to be selected so that they were farther away from artificial lighting.

- Many believe an increase in predation risk on open habitats occurs under bright moonlight, and will therefore occur under artificial lighting as well. Although no field study conclusively confirms or refutes this explanation, circumstantial evidence supports this idea (Longcore and Rich 2004).
- Bat foraging studies conducted at streetlights found a decrease in the attraction of moths to streetlights when lamps were changed from mercury vapor to high-pressure sodium vapor lamps (Rich and Longcore 2006).

Other studies, however, reflect different long-term findings. For example, studies have shown that within several weeks under constant lighting, migratory birds and mammals will quickly stabilize and reset their circadian rhythms back to their original schedules (when returned to normal lighting conditions).

The greatest impacts on wildlife from lighting will probably be to birds and insects that will be affected by the lights while migrating, causing them to alter their course or schedule. The tendency for nocturnal birds and other wildlife species (e.g., bats) to congregate around the lights to feed on insects attracted by the lights could also increase. This change in behavior could make these species more vulnerable to predation or injury (USACE 2003).

As such, lights will have minor to moderate, adverse and beneficial impacts on nocturnal wildlife depending on the species examined.

Effects on migratory birds could be substantial and are highly dependent upon the timing of tactical infrastructure construction. Implementing BMPs to avoid or minimize adverse effects could markedly reduce their intensity. A standard BMP to reduce or avoid adverse effects on migratory birds will include the following:

- Any groundbreaking construction activities should be performed before migratory birds return to the area (approximately 1 March) or after all young have fledged (approximately 31 July) to avoid incidental take.
- If construction is scheduled to start during the period in which migratory bird species are present, steps should be taken to prevent migratory birds from establishing nests in the impact corridor. These steps could include covering equipment and structures, and use of various excluders (e.g., noise). Birds can be hazed to prevent them from nesting on the site. Once a nest is established, they cannot be harassed until all young have fledged and left the nest site.
- If construction is scheduled to start during the period when migratory birds are present, a supplemental site-specific survey for nesting migratory birds should be performed immediately prior to site clearing.
- If nesting birds are found during the supplemental survey, construction should be deferred until the birds have left the nest. Confirmation that all young have fledged should be made by a competent biologist.

Assuming implementation of the above BMP to the fullest extent feasible, effects of the Project on migratory birds is anticipated to be short- and long-term, minor, and adverse due to construction disturbance and associated loss of habitat, and long-term, minor, and beneficial due to reduction of foot traffic through migratory bird habitat north of the impact corridor.

Aquatic Resources. Removal of vegetation and grading during construction could temporarily increase siltation in the river and therefore have short-term minor adverse effects on fish and aquatic resources within the Rio Grande.

7.3 SPECIAL STATUS SPECIES

7.3.1 Definition of the Resource

Although the Secretary's waiver means that CBP no longer has any specific obligation under the Endangered Species Act (ESA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the ESA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for threatened and endangered species. Three groups of special status species are addressed in this ESP: Federal threatened and endangered species, state threatened and endangered species, and migratory birds. Each group has its own definitions, and legislative and regulatory drivers for consideration; these are briefly described below.

Three groups of special status species are addressed in this ESP: Federal threatened and endangered species, state threatened and endangered species, and migratory birds. Each group has its own definitions, and legislative and regulatory drivers for consideration; these are briefly described below.

The ESA, as amended (16 U.S.C. 1531–1544 et seq.) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. Under the ESA, a Federal endangered species is defined as any species that is in danger of extinction throughout all or a significant portion of its range. The ESA defines a Federal threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

In 1973, the Texas legislature authorized the TPWD to establish a list of endangered animals in the state. State endangered species are those species which the Executive Director of the TPWD has named as being "threatened with statewide extinction." Threatened species are those species which the TPWD has determined are likely to become endangered in the future (TPWD 2007b).

In 1988, the Texas legislature authorized TPWD to establish a list of threatened and endangered plant species for the state. An endangered plant is one that is "in danger of extinction throughout all or a significant portion of its range." A threatened plant is one that is likely to become endangered within the foreseeable future (TPWD 2007b).

7.3.2 Affected Environment

An additional 15 species that are listed by the State of Texas as threatened or endangered have the potential to be present (see **Table 7-3**). Further information on the natural history of the federally listed species is presented in **Appendix E**.

Onsite review of the project area with USFWS biologists in September 2007 revealed that although the project area is within the range of the federally listed species, habitat for most of them does not occur within the project area. The ocelot and jaguarundi were the two Federal exceptions, with potential habitat for them observed during the site review. Although habitat similar to ocelot and jaguarundi corridor habitat occurs in the Del Rio impact area, this area is not considered potential cat corridor habitat because of the lack of evidence that either species occurs in the proximity of Del Rio or in Val Verde County. A biological survey of the project area, conducted November 5, 2007, recorded the presence of only one state-listed species, indigo snake *(Drymarchon corais*); and the presence of potential habitat for ocelot and jaguarundi. These two species are further discussed here. Detailed information on the methods and results of the November 5, 2007, survey and further information on the other Federal threatened or endangered species are provided in **Appendix E**.

The habitat of the jaguarundi is similar to that of the ocelot and is found within the Tamaulipan Biotic Province which includes several variations of subtropical thornscrub brush. Jaguarundi and ocelot both prefer dense thornscrub habitats with greater than 95 percent canopy cover. Habitat for the ocelot and jaguarundi occurs within Section M-1, although no records for either species are known from this area.

The indigo snake is listed as threatened by TPWD. This species occupies a range that includes Texas south of the Guadalupe River and the Balcones Escarpment. It inhabits thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors. The indigo snake can do well in suburban areas and irrigated croplands if not molested or indirectly poisoned. It requires moist microhabitats, such as rodent burrows, for shelter. An indigo snake was observed near wetland habitat in Section M-1.

Table 7-3. Federal- and State-Listed Species Potentially Occurring in the Impact corridor

Common Name	Scientific Name	County	Federal Status	State Status
Plants				
Texas snowbells	*Styrax texana*	VV	**E**	**E**
Tobusch fishhook cactus	*Ancistrocactus tobuschii*	VV	**E**	**E**
Mussels				
Texas hornshell (clam)	*Popenaias popeii*	VV	**C**	
Fish				
Blotched gambusia	*Gambusia senilis*	VV		**T**
Blue sucker	*Cycleptus elongates*	M		**T**
Conchos pupfish	*Cyprinodon eximius*	VV		**T**
Devils River minnow	*Dionda diabolic*	VV	**T**	**T**
Pecos pupfish	*Cyprinodon pecosensis*	VV		**T**
Proserpine shiner	*Cyprinella Proserpina*	M		**T**
Rio Grande darter	*Etheostoma graham*	M		**T**
Rio Grande silvery minnow	*Hybognathus amarus*	M	**E**	**E**
Amphibians				
South Texas siren (Large form)	*Siren sp. 1*	M		**T**
Reptiles				
Indigo snake	*Drymarchon corais*	M		**T**
Reticulate collared lizard	*Crotaphytus reticulatus*	M		**T**
Texas horned lizard	*Phrynosoma cornutum*	M		**T**
Texas tortoise	*Gopherus berlandieri*	M		**T**
Trans-Pecos black-headed snake	*Tantilla cucullata*	VV		**T**
Birds				
American peregrine falcon	*Falco peregrines anatum*	M	**DL**	**E**
Arctic peregrine falcon	*Falco peregrines tundrius*	M	**DL**	**T**
Interior least tern	*Sterna antillarum athalassos*	M, VV	**E**	**E**
Black-capped vireo	*Vireo atricapilla*	VV	**E**	**E**

Common Name	Scientific Name	County	Federal Status	State Status
Birds (continued)				
Brown pelican	*Pelecanus occidentalis*	VV	**E**	
Common black hawk	*Buteogallus anthracinus*	VV		**T**
Peregrine flacon	*Falco peregrines*	M	**DL**	**ET**
Zone-tailed hawk	*Buteo albonotatus*	VV		**T**
Mammals				
Gulf Coast jaguarundi	*Herpailurus yaguarondi*	M	**E**	**E**
Gray wolf	*Canis lupus*	M	**E**	**E**
Black bear	*Ursus americanus*	M	**T/SA;NL**	**T**
White-nosed coati	*Nasus narica*	M		**T**
Ocelot	*Leopardus pardalis*	M	**E**	**E**

Source: TPWD 2007a, USFWS 2007

Notes:

E = Endangered; T = Threatened; C = Candidate; T/SA = Threatened by Similarity of Appearance; NL = Not Listed; DL = Delisted

M = Maverick County (Section M-2A)

VV = Val Verde County (Section M-1)

7.3.3 Direct and Indirect Effects of the Project

CBP has coordinated closely with the USFWS regarding potential endangered species impacts associated with this project. The USFWS has provided critical feedback on the location and design of tactical infrastructure to avoid, minimize, or mitigate potential effects on listed species or designated critical habitat.

Potential effects on federally listed species are based on currently available data. Effect categories used in this document cannot be assumed to correlate to potential effects determinations which have not yet been made. Potential effects on state and federally listed species will be due to direct mortality during construction and operation, and loss of habitat (quality or quantity).

As part of the Project, a 150-foot-wide corridor (Section M-1) and up to a 60–foot–wide corridor (Section M-2A) containing the new primary pedestrian fence, access/patrol roads, lights, and construction staging areas will be cleared along approximately 3 miles (approximately 49 acres) during construction and a portion maintained following construction to support long-term maintenance, sight distance, and patrol activities. For the period of construction, lay-down areas for materials and equipment will be identified within the disturbed corridor.

Direct mortality during construction activities is unlikely for the ocelot, jaguarundi, or indigo snake, but the indigo snake will be the most susceptible of the three. Operational effects such as road kill of indigo snakes or disturbance of ocelots or jaguarundi potentially using the corridor will not be anticipated to increase measurably above current conditions. The use of lights for nighttime construction and the operational use of lights will have the potential to adversely affect any ocelot and jaguarundi in the vicinity of M-2A. However, the dense habitat through which these cats tend to move resists substantial light penetration. Lights used for construction and operations will be shielded to avoid unnecessary illumination of potential habitat for these two species. Finally, the Project for M-2A is proximal to a POE and runs along the edge of Eagle Pass, areas that already experience above-normal illumination. Therefore, it is not anticipated that impacts of lights (used during construction or operations) will have more than minor adverse impacts on any ocelot or jaguarundi inhabiting the area, should such species occur. USFWS expressed concern that the band of giant reed along the river could provide a movement corridor for the ocelot and jaguarundi. Under the Project, no giant reed will be removed south of the existing road paralleling the river in Section M-2A, retaining this potential movement corridor for these cats.

Construction grading for this route will result in 49 acres of clearing and removal of vegetation including approximately 9 acres of giant reed wetlands (habitat for the indigo snake, and movement corridor for ocelots and jaguarundi); strips and patches of sugarberry, granjeno, and honey mesquite woodland; honey mesquite and retama shrubland (habitat for ocelot and jaguarundi); Bermuda grassland; and Russian-thistle forbland communities. This loss of habitat within this section will result in negligible to minor (for cats and the indigo snake, respectively) short– and long-term, adverse effects on state- and Federal-listed species.

8. CULTURAL RESOURCES

8.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific obligation under the National Historic Preservation Act (NHPA), the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with the NHPA as the basis for evaluating potential environmental impacts and developing appropriate mitigations for cultural resources.

Cultural resources are commonly subdivided into archaeological resources, architectural resources, and traditional cultural properties (TCPs). Archaeological resources comprise areas where human activity has measurably altered the earth or where deposits of physical remains of human activity are found. Architectural resources include standing buildings, bridges, dams, and other structures of historic, architectural, engineering, or aesthetic significance. Traditional cultural resources include TCPs, which are properties eligible for or listed in the NRHP that Native Americans or other groups consider essential for the preservation of traditional cultures. Examples of TCPs are certain archaeological resources, prominent topographic features, habitat, plants, minerals, animals and their physical location or resource referent, and locations referenced in origin myths.

The NRHP is the official listing of properties significant in U.S. history, architecture, or prehistory, and includes both publicly and privately owned properties. The list is administered by the NPS on behalf of the Secretary of the Interior. Cultural resources that are listed in or eligible for listing in the NRHP (36 CFR 800.16(l)) are called historic properties. Properties are determined eligible for listing in the NRHP by the Secretary of the Interior (NPS) or by consensus of a Federal agency official and the SHPO. Generally, resources must be more than 50 years old to be considered for listing in the NRHP. More recent resources, such as Cold War-era buildings, might warrant listing if they have the potential to gain significance in the future or if they meet "exceptional" significance criteria. NRHP-listed properties of exceptional national significance can also be designated as NHLs by the Secretary of the Interior.

Buildings, structures, sites, objects, or districts are property types that might be considered historic properties. To be listed in or eligible for listing in the NRHP, a resource must be one of these property types, generally should be at least 50 years of age or older, and must meet at least one of the four following criteria (36 CFR 60.4):

- The resource is associated with events that have made a significant contribution to the broad pattern of history (Criterion A)

- The resource is associated with the lives of people significant in the past (Criterion B)
- The resource embodies distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic value; or represents a significant and distinguishable entity whose components might lack individual distinction (Criterion C)
- The resource has yielded, or could be likely to yield, information important in prehistory or history (Criterion D).

In addition to meeting at least one of the above criteria, a historic property must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics it possessed in the past and its capacity to convey information about a culture or group of people, a historic pattern, or a specific type of architectural or engineering design or technology. Resources that might not be considered individually significant can be considered eligible for listing on the NRHP as part of a historic district. According to the NPS, a historic district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects that are historically or aesthetically united by plan or physical development.

8.2 AFFECTED ENVIRONMENT

Area of Potential Effect

Cultural resource surveys were carried out within the Area of Potential Effect (APE) which is defined as the geographical area within which effects on historic properties might occur if such properties hypothetically exist. The APE should account for both direct and indirect effects. 36 CFR 800.5(a)(2) specifically cites visual effects and changes to the setting of a historic property where the setting contributes to the significance of the property as potential adverse effects that should be considered in delineating the APE of a Project. Other possible adverse effects include damage or destruction of historic properties due to grading, construction, noise, or vibrations.

In delineating the APE, direct effects will occur within a 60-footwide corridor that accounts for grading of vegetation and fence construction. A second, larger APE has been delineated for the Project to include indirect impacts on architectural or other aboveground cultural resources. Topography, type, and density of vegetation and intervening development, orientation of streets and properties in relation to the Project, traffic patterns, and surrounding development are factors considered in the definition of this latter APE for a specific location.

Previously Recorded Resources in the Vicinity

Information about previously recorded archaeological, historic, and architectural sites within a 1-mile radius of the Project was gathered from THC Texas Historic Sites Atlas and Texas Archaeological Sites Atlas, the Texas Archaeological Research Laboratory, and other sources. Resources recognized by THC as Recorded Texas Historic Landmarks (RTHLs) and those previously surveyed under their Neighborhood Survey program also were gathered. This information was plotted on Project maps, aerial photographs, and topographic maps to gain an idea of the types of resources likely to occur within the project areas, site densities, and areas of interest for further identification and evaluation. In general, previously reported prehistoric archaeological resources within 1 mile of the impact corridor include open air campsites and lithic scatters. Temporal and cultural affiliations for these sites are unclear, and few sites are very extensive.

Based on the Texas Historic Sites Atlas, the Texas Archaeological Site Atlas, and information at the Texas Archaeological Research Laboratory (TARL), Section M-1 passes within 1 mile of two RTHLs in Del Rio: the Brinkley Mansion and the Val Verde Winery. Section M-1 also passes within 1 mile of four archaeological sites and the historic marker for the Brinkley Mansion. Two of the archaeological sites are prehistoric. Little is known about the other two sites. None of these resources are within the APE for Section M-1 or will be affected by it.

Section M-2A passes within 1 mile of two properties listed in the NRHP. The Fort Duncan Historic District is 0.66 miles south of the southern terminus of Section M-2A, and the Maverick County Courthouse is 0.41 miles east of the southern terminus of Section M-2A. The Fort Duncan Historic District is a 1,000-acre property that was listed on the NRHP in 1971. The fort is historically significant for its mid-19th century military contributions and as an example of mid-19th century frontier military architecture. The Maverick County Courthouse, erected in 1885, is significant for its architectural and historic associations. It is located in downtown Eagle Pass. Additional information on these historic properties is presented in (see **Appendix F**). In addition to these two NRHP properties, five properties within 1 mile of Section M-2A are recognized as RTHLs or designated with Official State Historic Markers (OSHM). These properties are summarized in **Table 8-1**. These include the Eagle Pass Post Office, S.P. Simpson Jr. House, Church of the Redeemer, 420 Commercial Street, and the Lee Building. All of these properties are outside the APE for the Project.

Section M-2A is within 1 mile of four other previously recorded archaeological sites. The previously recorded site within the APE is 41MV65. It is a lithic artifact scatter of unknown temporal or chronological affiliation that covers an area of 180,000 square meters. The site was initially recorded in 1979 and although it was encountered by subsequent surveys the site form has not been updated since the initial recording and no recommendations have been made on

Table 8-1. NRHP-Listed Properties, Texas Historic Landmarks, and State Historic Markers near the Impact corridor

Section	Historic Property	Designation	Date of Construction/ Significance
M-1	Brinkley Mansion, Del Rio	RTHL	1934
M-1	Val Verde Winery, Del Rio	OSHM	1882
M-2A	420 Commercial Street, Eagle Pass	RTHL	1880s
M-2A	Fort Duncan National Register District	NRHP- Listed 1971	1848+
M-2A	Maverick County Courthouse	NRHP- Listed 1980	1884–5
M-2A	Church of the Redeemer, Eagle Pass	RTHL	1887
M-2A	Eagle Pass Post Office, Eagle Pass	RTHL	1912
M-2A	S.P. Simpson Jr. House, Eagle Pass	RTHL	1883
M-2A	Lee Building, Eagle Pass	RTHL, cont. structure to Fort Duncan NRHP District	1849–1875

its NRHP eligibility. Archaeological sites within 1 mile of the survey section include one possible Paleo-Indian site, two open-air camps of unknown cultural or temporal affiliation, and two historic sites.

Cultural Resources Surveys

Cultural resources surveys have been conducted within the impact corridors. The goal of these surveys is to identify cultural resources potentially affected by the Project. Tribal consultations are ongoing; and, as of February 2008, no resources of traditional, religious, or cultural significance to Native American tribes have been identified within the APE (direct construction effects).

An architectural/historic resource survey has been completed for Sections M-1 and M-2A. Fieldwork occurred between 4 and 8 January 2008. Preliminary research was performed prior to fieldwork to determine areas of interest, find construction dates when available from county tax records, and provide an historic context to frame the NRHP evaluation of cultural resources. The larger APE described above was surveyed for buildings and other historic resources. All resources constructed prior to 1969 were documented as per the recommendations of THC.

Forty-six buildings and other historic-period resources were surveyed in Sections M-1 and M-2A. Three properties in Section M-1 and 12 properties in Section M–2A were recommended eligible for NRHP listing. The majority of these resources is residential in nature and is significant as excellent examples of early 20th-century residential building styles and construction methods.

Archaeological surveys of Sections M-1 and M-2A have been conducted. Two sites were identified. In Section M-1 a small, previously unrecorded site was located. It will be tested to enable NRHP eligibility evaluation. In Section M-2A, one previously recorded site was identified in the survey. It also will need to be tested to enable NRHP eligibility evaluation.

Native American tribes with ancestral ties to lands within the Del Rio Sector have been contacted for input on the cultural resources survey; however, no input has been received to date

8.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

One previously recorded archaeological site was identified within the APE for Section M-2A. This site will require testing to enable its NRHP eligibility evaluation. As a result of the architectural survey of Section M-2A, 12 historic houses have been recommended eligible for the NRHP. These properties are located on Commercial, Ryan, Jefferson, and Ceylon streets. The Project calls for a retaining wall to be integrated into the bluff along the southern half of Section M-2A. This wall will reduce visual effects on the houses on Commercial and Ryan streets. The three houses on Commercial Street might incur short-term impacts from noise, dust, and vibrations during construction. The two houses on Ryan Street might incur minor long-term visual impacts from proximity to the infrastructure, and short-term impacts from noise, dust, and vibrations during construction. The three houses on Commercial, Jefferson, and Ceylon streets recommended as NRHP-eligible might incur minor long-term visual impacts. However, Section M-2A will be a distant element in the open viewshed of these residences.

The Fort Duncan Historic District, including the Lee Building, Maverick County Courthouse, Eagle Pass Post Office, Church of the Redeemer, and S.P. Simpson Jr. House, are removed geographically from the project area and will not be affected by Section M-2A. These properties are located a considerable distance from Section M-2A and outside its APE for visual and other effects. A residence at 420 Commercial Street, an RTHL, is located a developed city block from the southern terminus of M-2A, a distance of about 250 feet. It will not be affected by the Project.

In Section M-1, one archaeological site, previously unrecorded, was identified and will be subject to archaeological testing to enable NRHP eligibility evaluation. Three historic-era resources are recommended as NRHP eligible in Section M-1. One of the historic-era resources surveyed is a residential/commercial structure on Las Vacas Street and the other two are residences on Qualia Drive. Section M-1 will primarily parallel the USIBWC floodplain at distances of 50–500 feet south of Garza Lane and Rio Grande Road. On the west side of the POE, the route will cross Rio Grande Road and proceed north to meet a new toll facility. The Project will continue on the east side of the POE and parallel Rio Grande Road, terminating approximately 50 feet from the intersection at Qualia Drive. The three residences recommended as eligible for the NRHP might incur minor long-term visual impacts from Section M-1.

9. SOCIOECONOMIC RESOURCES

9.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts associated with socioeconomic resources.

Socioeconomics. Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly characteristics of population and economic activity. Regional birth and death rates and immigration and emigration affect population levels. Economic activity typically encompasses employment, personal income, and industrial or commercial growth. Changes in these two fundamental socioeconomic indicators are typically accompanied by changes in other components, such as housing availability and the provision of public services.

Data in three areas provide key insights into socioeconomic conditions that might be affected by a Project. Data on employment identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on personal income in a region can be used to compare the “before” and “after” effects of any jobs created or lost as a result of a Project. Data on industrial or commercial growth or growth in other sectors provide baseline and trend line information about the economic health of a region.

Demographics identify the population levels and changes to population levels of a region. Demographics data might also be obtained to identify, as appropriate to the evaluation of a Project, a region’s characteristics in terms of race, ethnicity, poverty status, educational attainment level, and other broad indicators.

Socioeconomic data in this chapter are presented at census tract, county, and state levels to characterize baseline socioeconomic conditions in the context of regional and state trends. Census tracts are designed to be relatively homogenous units with respect to population characteristics, economic status, and living conditions at the time of establishment. Data have been collected from previously published documents issued by Federal, state, and local agencies; and from state and national databases (e.g., U.S. Census Bureau).

Environmental Justice and Protection of Children. There are no Federal regulations specifically addressing socioeconomics; however, there is one EO that pertains to environmental justice issues. Although the Secretary’s waiver means that CBP no longer has any specific obligation under Executive Order (EO) 12898, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines associated with EO 12898 as the basis for evaluating potential environmental impacts and developing appropriate mitigations for air quality.

EO 12898 is included in the socioeconomic resources section because it relates to various socioeconomic groups and the health effects that could be imposed on them. On February 11, 1994, President Clinton issued EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This EO requires that Federal agencies' actions substantially affecting human health or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. The purpose of the EO is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, tribal, and local programs and policies.

Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a project. Databases were searched in an attempt to identify potential sources of environmental hazards near the Project. Such information aids in evaluating whether a project will render vulnerable any of the groups targeted for protection in the EO. EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, addresses the Federal policy of protection of children from exposure to disproportionate environmental health and safety risks. This EO established that each agency has a responsibility to ensure that its policies, programs, activities, and standards address risk to children that results from environmental health risks or safety risks.

9.2 AFFECTED ENVIRONMENT

Socioeconomics. Tactical infrastructure will occur adjacent to residential and commercial areas in the United States. The most current census tract data are from Census 2000. Section M-1 is within Val Verde County, Census Tract 9507 and Section M-2A is within Maverick County, Census Tract 9505. For the purposes of this Project, Census Tract 9507 is considered the Region of Influence (ROI) in Val Verde County and Census Tract 9505 is considered the ROI in Maverick County.

The largest employment type in Census Tract 9507, Val Verde County, Census Tract 9505, Maverick County, and Texas is educational, health, and social services, which accounts for 25.0, 21.4, 32.5, 26.7, and 19.3 percent, respectively, of employed persons (see **Table 9-1**) (U.S. Census Bureau 2002). Construction accounts for 5.9 percent of the employed persons in Census Tract 9507, 7.5 percent in Val Verde County, 2.7 in Census Tract 9505, 6.8 percent in Maverick County, and 8.1 percent in the State of Texas.

Table 9-1. Employed Persons by Industry Type in Census Tracts, Val Verde and Maverick Counties, and the State of Texas (Percent)

Economic and Social Indicators	Census Tract 9507	Val Verde County	Census Tract 9505	Maverick County	State of Texas
Employed Persons in Armed Forces	0.6	4.0	0.4	0.1	0.7
Employed Persons in Civilian Labor Force (By Industry)					
Agriculture, forestry, fishing and hunting, and mining	1.8	2.8	5.0	3.8	2.7
Construction	5.9	7.5	2.7	6.8	8.1
Manufacturing	10.6	10.7	8.6	10.1	11.8
Wholesale trade	1.3	2.1	2.9	2.0	3.9
Retail trade	8.8	13.8	14.8	14.7	12.0
Transportation and warehousing, and utilities	6.6	6.0	5.5	9.6	5.8
Information	0.4	1.0	1.2	1.2	3.1
Finance, insurance, real estate, and rental and leasing	5.9	3.6	4.0	3.7	6.8
Professional, scientific, management, administrative, and waste management services	5.3	5.5	3.6	3.3	9.5
Educational, health and social services	25.0	21.4	32.5	26.7	19.3
Arts, entertainment, recreation, accommodation and food services	10.1	8.4	6.5	5.8	7.3
Other services (except public administration)	7.9	5.3	2.9	4.7	5.2
Public administration	10.5	11.9	10.0	7.6	4.5

Source: U.S. Census Bureau 2002

Note: Census 2000 data are the most recent comprehensive employment data for the ROI.

In 2006, Val Verde and Maverick counties had unemployment rates of 6.1 percent and 13 percent, respectively, compared to a 4.9 percent unemployment rate for Texas (Fedstats 2007a, 2007b). **Table 9-2** shows demographic data and economic indicators of the ROI, Val Verde and Maverick counties, and the State of Texas.

Table 9-2. Demographic and Economic Characteristics of Census Tracts, Val Verde and Maverick Counties, and the State of Texas

	Census Tract 9507	Val Verde County	Census Tract 9505	Maverick County	Texas
Total Population	6,397	44,856	5,685	47,297	20,851,820
Percent Hispanic or Latino	83.3	75.5	93.2	95.0	32.0
Percent White	81.1	76.4	68.0	70.9	71.0
Percent Black or African American	0.9	1.5	0.4	0.3	11.5
Percent American Indian Alaska Native	0.7	0.7	0.5	1.3	0.6
Percent Asian	0.1	0.6	1.0	0.4	2.7
Percent Native Hawaiian and Other Pacific Islander	0.1	0.1	0.0	<0.1	0.1
Percent "Some other race"	14.7	18.2	26.5	24.1	11.7
Percent Reporting 2 or more races	2.4	2.6	3.7	2.9	2.5
Percent Below Poverty	28.9	26.1	37.2	34.8	15.4
Per Capita Income	$13,070	$12,096	$9,644	$8,758	$19,617
Median Household Income	$23,667	$28,376	$17,218	$21,232	$39,927

Source: U.S. Census Bureau 2002

Note: Census 2000 data are the most recent comprehensive economic and demographic data for the ROI.

The populations of Ciudad Acuña and Piedras Negras, Mexico, are approximately 124,232 and 142,011, respectively. The Del Rio POE connects Ciudad Acuña and Del Rio (TxDOT 2007a). There are two POEs (Camino Real International Bridge and Eagle Pass Bridge I) and one international rail bridge that connect Eagle Pass to Piedras Negras.

Environmental Justice and Protection of Children. The ROI is considered to have a disproportionately high percentage of low-income or minority residents under either of two conditions: (1) the percentage of low-income (below poverty) or minority populations (race other than "white alone," or Hispanic or Latino) within each census tract is greater than its perspective county's minority percentage or low-income percentage, or (2) the percentage of persons in low-income or minority populations within each census tract is greater than 50 percent. Census Tract 9507 has a higher percentage of low-income and Hispanic or Latino residents than the county. **Table 9-2** shows that 28.9 percent of the population in Census Tract 9507 is living below the poverty level as compared to 26.1 percent in Val Verde County and 15.4 percent in Texas. Eighty-three percent of the population of Census Tract 9507 is Hispanic or Latino as compared to 75.5 percent of Val Verde County and 32 percent of Texas. Census Tract 9505 has a higher percentage of minority and low-income residents than Maverick County (see **Table 9-2**). Approximately 32 percent of residents in Census Tract 9505 reported to be a race other than "white alone," while 93.2 percent reported to be Hispanic or Latino, compared to 29.1 percent and 95 percent, respectively, in Maverick County. In addition, approximately 37.2 percent of the population in Census Tract 9505 live below the poverty line, as compared to 34.8 percent in Maverick County and 15.4 percent in the State of Texas.

Residents living in the ROI have a lower median household income than that of their respective county and the State of Texas (see **Table 9-2**). However, the per capita incomes of Census Tracts 9507 and 9505 are higher than Val Verde and Maverick counties, respectively, but lower than the State of Texas.

In Section M-1, the Project will be south of the existing residential and commercial structures along Garza Lane and Rio Grande Road, and will run 0.18 miles in a northeasterly direction, across Rio Grande Road to the new POE toll facility currently under construction.

9.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

Socioeconomics. Short-term minor direct beneficial effects will be expected as a result of the construction, operation, and maintenance of the Project. The construction activities will occur from Spring 2008 to December 2008. Some local materials, supplies, and contractors will be used, providing a minor beneficial effect on the local economy through new jobs and increased local spending. Construction of the tactical infrastructure will require up to 75 workers consisting of one fabrication crew (35 workers) and one installation crew (40 workers) completing 1 mile of tactical infrastructure per month. Based upon U.S. Census data, there are 1,051 and 872 construction workers in Val Verde and Maverick counties, respectively. The 75 construction workers required for this Project represent approximately 7 percent and 9 percent of the available construction workers in Val Verde and Maverick counties, respectively (U.S. Census Bureau 2002). Due to the existing supply of construction workers in each of these counties, it will likely not be necessary for workers from other locations to participate in the construction activities. The temporary nature of the construction and new employment (up to 75 workers) associated with the Project will have a minor indirect beneficial effect on local businesses and the local economy from the temporary influx of construction workers.

The tactical infrastructure will intersect 20 private and public land parcels. Additionally, the Project will be south of the existing residential and commercial structures along Garza Lane and Rio Grande Road, and will run 0.18 miles in a northeasterly direction, across Rio Grande Road to the new POE toll facility currently under construction. The additional 0.18-mile portion of the infrastructure will run adjacent to several additional structures on State Spur 239.

The construction and operation of the infrastructure along State Spur 239 could cause minor adverse socioeconomic effects on any businesses that might operate in the immediate vicinity due to indirect adverse effects associated with the visual effects (see **Chapter 4.2.3**) and noise effects (see **Chapter 3.3**), as well as decreased access from State Spur 239.

Environmental Justice and Protection of Children. Minor adverse disproportionate effects on minority or low-income populations could occur, as the Project will intersect 20 parcels, running behind or adjacent to the structures. Direct beneficial effects on safety and the protection of children will be expected from the projected deterrence of cross-border violators, to include smugglers, terrorists, and terrorist weapons from entering the United States. Therefore, border communities will be safer for minority and low-income populations and children. Indirect adverse effects associated with the visual effects (see **Chapter 4.2.3**) and noise effects (see **Chapter 3.3**) will occur.

The closure of Rio Grande Road and diversion of future through-traffic to SR 277 along Alderete Lane are not part of the Project. Therefore, any potential socioeconomic, environmental justice, and safety effects were previously discussed in a Supplemental Environmental Impact Statement prepared by the General Services Administration (GSA) (GSA 2004).

The tactical infrastructure will have short- to long-term direct beneficial effects on children and safety in the surrounding areas. The addition of tactical infrastructure could increase the safety of USBP agents in the USBP Del Rio Sector. In addition, this Project will help to deter cross-border violators in the immediate area, which could prevent illegal aliens, smugglers, and their contraband from entering.

10. UTILITIES AND INFRASTRUCTURE

10.1 DEFINITION OF THE RESOURCE

Although the Secretary's waiver means that CBP no longer has any specific legal obligations for the tactical infrastructure segments addressed in this ESP, the Secretary committed CBP to responsible environmental stewardship of our valuable natural and cultural resources. CBP supports this objective and has applied the appropriate standards and guidelines for evaluating environmental impacts on utilities and infrastructure.

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as “urban” or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area. The infrastructure components discussed in this chapter include municipal water systems, sanitary sewer systems, storm water drainage systems, solid waste management, and utilities, including electrical and natural gas systems.

Solid waste management primarily relates to the availability of landfills to support a population’s residential, commercial, and industrial needs. Alternative means of waste disposal might involve waste-to-energy programs or incineration. In some localities, landfills are designed specifically for, and limited to, disposal of construction and demolition debris. Recycling programs for various waste categories (e.g., glass, metals, papers, asphalt, and concrete) reduce reliance on landfills for disposal.

10.2 AFFECTED ENVIRONMENT

Municipal Water Systems. The Rio Grande and several aquifers, reservoirs, and springs are the main sources of water for many communities and cities in Maverick and Val Verde counties. Municipal water infrastructure within the impact corridor includes the Eagle Pass Regional Water Treatment Plant (WTP) and associated interceptor, collector, distribution, or transmission pipelines; pumps; and storage tanks (see **Table 10-1**), which are located at the northern terminus of Section M-2A. This WTP removes and treats water from the Rio Grande for drinking water for the City of Eagle Pass, portions of Maverick County, and the Kickapoo Indian Nation.

Municipal Sanitary Sewer Systems. Some municipal sanitary sewer systems in Maverick and Val Verde counties discharge through the land application method, while others discharge into water bodies, including the Rio Grande and San Felipe Creek (USEPA 1998, BECC undated). The Silver Lake Wastewater

Table 10-1. Water/Sewer Systems Infrastructure Within the Impact Corridor

Section	Water/Sewer Systems Infrastructure
M-1	Silver Lake Wastewater Treatment Plant (includes associated infrastructure)
M-2A	Eagle Pass Regional Water Treatment Plant (includes associated infrastructure)

Treatment Plant (WWTP) and its associated pipelines, pumps, and storage tanks are located within the impact corridor, approximately 0.5 miles south of Cienegas Creek at the northern terminus of Section M-1 (see **Table 10-1**). This WWTP provides sewerage services for the City of Del Rio, and discharges into the Rio Grande and through the land application method.

Storm Water Drainage Systems. No storm water drainages are known to occur within the impact corridor; however the number of storm water drainage systems along the impact corridor has not been inventoried.

Solid Waste Management. As of 2005, there was one active municipal landfill in Maverick County and one active municipal landfill in Val Verde County. The remaining capacity in terms of years for these landfills was determined based on compaction rate and the amount disposed of in 2005 (TCEQ 2006). The remaining capacity of these landfills as of 2005 is reported in **Table 10-2**.

Table 10-2. Remaining Capacity of Municipal Landfills as of 2005

Landfill Name	County	Remaining Capacity* (Years)
City of Eagle Pass Type IV Landfill Site	Maverick	90.54
City of Del Rio Municipal Landfill	Val Verde	15.20

Source: TCEQ 2006
Note: * Based on rate of compaction and amount disposed of in 2005.

Electrical and Natural Gas Systems. There are overhead electric lines adjacent and perpendicular to Section M-2A, and natural gas pipelines run along the Rio Grande and the roadway (Garza Lane and Rio Grande Road) at Section M-1. Lights that will be installed along Sections M-1 and M-2A will connect into existing electric distribution infrastructure in the area.

10.3 DIRECT AND INDIRECT EFFECTS OF THE PROJECT

No effects on storm water drainage systems, or electrical and natural gas systems, will be expected due to the absence of these systems' infrastructure within the impact corridor. However, if infrastructure was identified during design, short-term minor adverse effects on these systems could occur. The primary pedestrian fence line and patrol road will avoid most storm water drainage culverts or reroute the Project around this infrastructure. Any infrastructure that will be affected by the construction will be moved, and temporary interruptions to these systems could be experienced. No long-term effects will be expected.

The Project will not substantially increase impervious surface area that could potentially affect local storm water management. Adherence to proper engineering practices will reduce storm water runoff-related effects to a level of insignificance. In addition, erosion and sedimentation controls will be in place during construction to reduce and control siltation or erosion effects on areas outside of the construction site.

Short-term minor adverse effects on municipal water and sanitary sewer systems will be expected due to the presence of the Silver Lake WWTP and the Eagle Pass Regional WTP and the associated infrastructure (e.g., pipelines, pumps, and tanks) along Section M-1 and Section M-2A. Any infrastructure that will be affected by the construction will be moved. No long-term effects will be expected.

Short-term minor adverse effects on solid waste management will be expected. Solid waste generated from the construction activities will consist of building materials such as concrete and metals (conduit and piping). The contractor will recycle construction materials to the greatest extent possible. Nonrecyclable construction debris will be taken to either the City of Eagle Pass Type IV Landfill Site or the City of Del Rio Municipal Landfill, which are both permitted to take this type of waste. Both landfills have sufficient capacity. Therefore, solid waste generated as a result of the Project will be expected to be negligible compared to the solid waste currently generated in Maverick and Val Verde counties, and will not exceed the capacity of either landfill.

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11. RELATED PROJECTS AND POTENTIAL EFFECTS

The following analysis summarizes expected environmental effects from the Project when added to other past, current, and reasonably foreseeable future actions. The geographic scope of the analysis varies by resource area. For example, the geographic scope of cumulative impacts on resources such as noise, visual resources, soils, and vegetation is very narrow and focused on the location of the resource. The geographic scope of air quality, wildlife and sensitive species, and socioeconomic resources is much broader and considers more county- or regionwide activities. Projects that were considered for this analysis were identified by reviewing USBP documents, news releases, and published media reports, and through consultation with planning and engineering departments of local governments, and state and Federal agencies. Projects that do not occur in close proximity (i.e., within several miles) of the fence will not contribute to a cumulative impact and are generally not evaluated further.

11.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Cumulative Fencing, Southern Border. There are currently 62 miles of landing mat fence at various locations along the U.S./Mexico international border (CRS 2006); 14 miles of single, double, and triple fence in San Diego, California; 70 miles of new pedestrian fence constructed at various locations along the U.S./Mexico international border; and fences at POE facilities throughout the southern border. In addition, 225 miles of fence are planned (including the approximately 4 miles presented in this ESP). New fence sections are also being studied for specified areas in Texas, New Mexico, Arizona, and California.

Past Actions**.** Past actions are those actions that occurred within the geographic scope of cumulative impacts prior to the development of this ESP. Past actions have shaped the current environmental conditions in close proximity (i.e., within several miles) to the infrastructure. Therefore, the effects of identified past actions are now part of the existing environment, and are generally included in the affected environment described in each resource chapter of this ESP.

- Secure Border Initiative (SBI). The SBI is a comprehensive multi-year plan established by the DHS to secure America's borders and reduce illegal immigration. DHS's comprehensive plan to gain effective control of our Nation's borders includes substantial investments in technology, infrastructure, and enforcement personnel. SBI supports CBP frontline agents and officers by deploying an optimal, integrated solution that develops, installs, and integrates technology and tactical infrastructure solutions. Examples of planned tactical infrastructure could consist of, but not limited to, roads, pedestrian and vehicle fence, and lights.

Present Actions. Present actions include current or funded construction projects, CBP or other agency operations in close proximity to the infrastructure locations, and current resource management programs and land use activities within the affected areas. Ongoing actions considered in the cumulative effects analysis include the following:

- Office of Field Operations CBP. The Del Rio POE facility is currently being expanded by the GSA, and is scheduled for completion in early 2008 (TxDOT 2007a). The project will bring the primary inspection facilities and possibly toll booths further into the City of Del Rio, as well as expand the bridge over the Rio Grande from four to six lanes (PPTCC 2007).
- Texas Department of Transportation (TxDOT). TxDOT has several ongoing road construction and improvement projects scheduled for the counties potentially impacted by the project. However, the geographic scope of cumulative impacts would tend to be small, as the majority of the construction would be within existing ROWs. These projects are in various stages of completion:
    - *Rehabilitation Projects.* Several rehabilitation projects in the area include resurfacing of an approximate 3-mile section of U.S. Highway 277 south of U.S. Highway 377 in Del Rio, and a 0.6-mile section of U.S. Highway 277 in Eagle Pass.
    - *Ports to Plains Corridor.* This project consists of a 1,400-mile highway route stretching from the U.S./Mexico international border in Laredo, Texas, to Denver, Colorado. The route was designated a High Priority Corridor under the *Transportation Equity Act for the 21st Century*. The project is a joint effort by the state departments of transportation from Colorado, Texas, Oklahoma, and New Mexico to evaluate transportation improvement needs along the existing corridor to facilitate and enhance trade between the United States and Mexico. Currently, a Feasibility Study and a Corridor Development and Management Plan have been completed for this project. The route would utilize U.S. Highway 277 through Del Rio and Eagle Pass, Texas, and would include the construction of relief routes and other upgrades in these areas (TxDOT 2007b).
    - *State Loop 480.* Construction of an outer loop from the Camino Real International Bridge around the City of Eagle Pass was scheduled to begin in 2007. Phase I includes construction of a four-lane divided highway on a new location with two grade separated interchanges, and will extend from the Camino Real International Bridge to U.S. Highway 57. Phase II construction is in the process of being coordinated, and will include building a connecting highway from U.S. Highway 57 to U.S. Highway 277 North (TxDOT 2007a).

- *Eagle Pass Truck Route.* Several phases of this project have been completed to date; however construction of an overpass is scheduled to begin in May 2009 (TxDOT 2007a).

- North American Development Bank (NADB). The NADB is funding several projects in Maverick County, Texas, as well as Piedras Negras and Ciudad Acuña, Mexico, which are south of the cities of Del Rio and Eagle Pass, respectively (NADB 2007).
  - *Water and Wastewater Regional System Improvements (Eagle Pass, Texas).* Construction of a new wastewater treatment plant, including transmission mains and sewer lines began in August 2007.
  - *Water Conservation Improvement Project (Maverick County, Texas).* The lining of lateral canals within the Maverick County Water Control and Improvement District No. 1 is scheduled to be undertaken in December 2007.
  - *Comprehensive Sanitation Project (Piedras Negras, Coahuila, Mexico).* Phase I of this project is complete; however construction of three collector and sewer line elements is currently underway. This project will allow wastewater to be adequately treated, and eliminate raw sewage discharges into the Rio Grande.
  - *Comprehensive Sanitation Project (Ciudad Acuña, Coahuila, Mexico).* Phase I of this project is complete; however construction of 14 collector and sewer line elements is currently underway. This project will allow wastewater to be adequately treated, and eliminate raw sewage discharges into the Rio Grande.
  - Maverick County Detention Facility. The GEO Group, Inc., will develop, manage, and operate a 654-bed detention facility in Eagle Pass, Texas, which is expected to be used by Maverick County and other state and Federal detention agencies. The project is expected to be complete in 2008. GEO estimates that the facility will generate approximately $10 million in annual operating revenues at full occupancy (All Business 2007).

***Reasonably Foreseeable Future Actions*.** Reasonably foreseeable future actions consist of activities that have been proposed or approved and can be evaluated with respect to their effects. The following are reasonably foreseeable future actions that are related to securing the southern international border:

- Texas Department of Transportation. In addition to TxDOT's ongoing construction and maintenance projects, there are several TxDOT projects in the planning phases. The Del Rio Outer Loop (also known as the Del Rio Relief Loop) is a four-lane, 12.1-mile highway segment. Phase I will consist of a two-lane highway connecting U.S. Highway 277 South and U.S. Highway 90 West with overpass spans and an additional highway connection to Laughlin Air Force Base (TxDOT 2007a). Construction of the project is expected to begin in mid to late 2008, with completion scheduled for 2011 (Southwest Texas Live 2007).

- Eagle Pass Road and Various Infrastructure Projects. CBP plans improvements to 1.3 miles of existing patrol roads along the eastern bank of the Rio Grande and construction and maintenance of 1.1 miles of primary pedestrian fence with an aesthetic quality in Eagle Pass, Texas. The project includes the installation of 15 permanent lights along the eastern boundary of Eagle Pass Golf Course.
- Expansion of Eagle Pass Border Station. The City of Eagle Pass and GSA jointly developed a master plan for phased expansion of the border station. Phase I of the border station was built by the City and is leased to GSA. Phase II of the expansion of the border station is to be designed and constructed by GSA on land donated by the City. This project is on hold pending donation of land (TxDOT 2008).
- Proposed Housing Development (Northern end of Section M-2A). A housing development has been proposed for the area north of the western terminus of Section M-2A. The development would include the construction of new residences, streets, and other public works/utility infrastructure.
- Giant Reed Removal Project. In a separate action, CBP plans to remove additional giant reed along Section M-1 from the primary pedestrian fence to the Rio Grande in order to decrease cover, which is used by cross-border violators, and increase USBP agents' line of sight towards the Rio Grande.

Table 11-1 presents the cumulative effects that might occur from implementation of the Project.

11.2 AIR QUALITY

Short-term, minor, adverse cumulative impacts on air quality would be expected from the construction of tactical infrastructure in combination with other reasonably foreseeable future actions. As discussed in **Chapter 2**, emissions from construction, operation, and maintenance activities would not contribute to or affect local or regional attainment status with the NAAQS, and would be below thresholds established by the USEPA for CAA cumulative impacts analysis. Construction equipment would temporarily increase fugitive dust and operation emissions from combustion fuel sources. Since there would be no substantive change in USBP operations for this Project, emissions from vehicles would remain constant and no cumulative impacts on air quality would be expected.

Table 11-1. Summary of Potential Cumulative Effects

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Air Quality	Attainment criteria for all criteria pollutants.	Existing emissions sources continue to adversely affect regional air quality.	Fugitive dust and combustion emissions generation during construction.	Existing emissions sources continue to adversely affect regional air quality.	Continued attainment.
Noise	Commercial and residential development, vehicles dominate ambient noise near urban areas.	Commercial and residential development, vehicles dominate ambient noise near urban areas.	Short-term noise from construction equipment and increased traffic.	Commercial and residential development near urban areas contributes to ambient noise.	Existing sources would be the dominant noise source. Negligible cumulative impacts.
Land Use, Recreation, and Visual Resources	Agricultural/open lands impacted by development. Past development affected natural viewshed.	Development of open and agricultural lands. Development of natural areas for community and industry infrastructure.	Government would purchase land or easements to construct tactical infrastructure. Natural areas developed for tactical infrastructure. Constant static visual interruption at fixed points.	Commercial development permanently alters natural areas and agricultural lands. Constant static visual interruption at fixed points.	Moderate adverse impacts on open and agricultural lands. Minor to moderate long-term impacts from permanent infrastructure.

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Geology and Soils	Installation of infrastructure and other features.	Installation of infrastructure; continued cross-border violator activities adversely affect soils.	Minor grading and recontouring would disturb soils; installation of primary pedestrian fence might affect geology.	Continued illegal border crossings adversely affect soils.	Minor long-term impact from new development.
Water Use and Quality					
Hydrology and Groundwater	Degradation of aquifers due to historical pollution.	Continued degradation of aquifers from pollution.	Short-term minor adverse effects on hydrology from grading and contouring. Short-term minor adverse effects from possible use of groundwater.	Improvements to the WWTP should reduce current adverse impacts on water quality.	Minor short- and long-term impacts.
Surface Waters and Waters of the United States	Point and nonpoint discharges including wastewater treatment effluent, agricultural runoff, and storm water have impacted water quality. Removal of wetland vegetation and fill of waters of the United States, including wetlands.	Point and nonpoint discharges including wastewater treatment effluent, agricultural runoff, and storm water have impacted water quality.	Construction erosion and sediment runoff, potential oil spills and leaks. Removal of wetland vegetation and fill of waters of the United States, including wetlands, and temporary degradation of water quality.	Construction erosion and sediment runoff, potential oil spills and leaks. Removal of wetland vegetation and fill of waters of the United States, including wetlands, and temporary degradation of water quality.	Moderate short-term impacts from construction activities, including removal of wetland vegetation and fill of waters of the United States, and temporary degradation of water quality. Minor long-term erosion impacts from infrastructure.

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Floodplains	Permanently altered by development.	None.	Adverse impacts due to installation of tactical infrastructure in floodplain.	New development could add impervious areas and alter peak flow or floodplain capacity during high-volume storm events.	Minor contribution to cumulative impacts from construction of tactical infrastructure in floodplain.
Biological Resources					
Vegetation	Degraded historic habitat of sensitive and common wildlife species.	Continued urbanization results in reduction of landscape area, loss of native species, and introduction of nonnative species.	Minor to moderate loss of native species and habitat, and creation of corridors for nonnative species establishment.	Development causes minor to moderate loss of native species and habitat and introduction of nonnative species.	Moderate contribution to adverse impacts on native habitats and vegetation.
Wildlife and Aquatic Resources	Urbanization and loss of green corridors impacted habitat and food sources.	Minor to moderate loss of green corridor for wildlife.	Minor loss of green corridor and water access for wildlife.	Loss of green corridor for wildlife.	Moderate loss of green corridor and water access for wildlife.
Special Status Species	Degraded water quality and urbanization impacted threatened and endangered species.	Urbanization degraded habitat for threatened and endangered species.	Minor loss of green corridor/habitat and water access for wildlife.	Development reduces suitable habitat for threatened and endangered species and water quality degradation.	Current and future activities would continue to decrease green corridor/habitat and water access for wildlife.

Resource	Past Actions	Current Background Activities	Project	Known Future Actions	Cumulative Effects
Cultural Resources	Development and infrastructure improvements adversely affected cultural resources.	Development and infrastructure improvements adversely affect cultural resources.	Moderate to major long-term adverse impacts on cultural resources.	Continued development and infrastructure improvements adversely affect cultural resources.	Moderate to major long-term adverse impacts on cultural resources.
Socioeconomic Resources	Commercial and residential development affected local economies.	Commercial and residential development.	Minor to moderate short-term and long-term beneficial impacts on local economy and safety.	Commercial development and infrastructure improvements around urban areas.	Minor stimulation of local economy from construction projects and improvement of roadways. Minor adverse impacts on environmental justice or protection of children and human health and safety.
Utilities and Infrastructure	Historical development and maintenance of utilities and infrastructure in area.	Utilities and infrastructure have been upgraded as necessary.	Minor short-term adverse impacts on local utilities and infrastructure during construction.	Continued development and maintenance of utilities and infrastructure in area.	Major benefit to infrastructure and utilities from addition and upgrade of facilities.

11.3 NOISE

Minor cumulative impacts on ambient noise would be expected from the additive impacts of construction, operation, and maintenance of tactical infrastructure, and anticipated residential and commercial development activities and infrastructure improvement projects that routinely occur throughout the project area. Noise intensity and duration from construction, operation, and maintenance of tactical infrastructure would be similar to construction activities from other development activities and road construction and maintenance. Because noise attenuates over distance, a gradual decrease in noise levels occurs the farther a receptor is away from the source of noise. Construction, operation, and maintenance of tactical infrastructure would be distant from most other substantial noise-generating activities. Increased noise from construction of tactical infrastructure could combine with existing noise sources or other construction activities to produce a temporary cumulative impact on sensitive noise receptors. Construction noise would not be louder, but might be heard over a greater distance or over a longer time period.

11.4 LAND USE AND VISUAL RESOURCES

Construction of tactical infrastructure would result in minor changes to land use. Recent activities that have affected land use near the tactical infrastructure are increased commercial and residential development of agricultural and open lands. Moderate cumulative impacts on land use are expected from the additive effects of the past, present, and reasonably foreseeable future actions, but changes in local land use would continue to be dominated by development. For example, the conversion of approximately 49 to 61 acres to support tactical infrastructure would be minimal when compared to other development occurring in Val Verde and Maverick counties. Residential areas and agricultural lands would be displaced by the Project. Future development of residential areas would further alter the current land use.

Minor to moderate impacts on aesthetics and visual resources would be expected from the additive effects of past, present, and reasonably foreseeable future actions. The presence of construction equipment would produce a short-term adverse impact on visual resources. Once installed, the tactical infrastructure would create a permanent visual interruption at fixed points. Adverse cumulative effects could include temporary construction impacts and the introduction of light poles and increased night illumination during construction. Other development activities would introduce night illumination into previously open or agricultural lands. Recreational activities such as star gazing would be adversely affected in certain locations by this cumulative impact in night illumination.

11.5 GEOLOGY AND SOILS

Additive effects include minor changes in topography due to grading, contouring, and trenching; minor soil disturbance; a minor increase in erosion; and a minor loss of prime farmland. Construction of most of the tactical infrastructure would not be in close proximity to residential and commercial development and would not cumulatively affect geological resources, including soils. However, each present or reasonably foreseeable future action identified has the potential for temporary erosion from construction activities.

11.6 WATER USE AND QUALITY

11.6.1 Hydrology and Groundwater

Moderate impacts on hydrology and groundwater would occur from the construction of tactical infrastructure when combined with other past, present, and reasonably foreseeable future actions due to increased erosion and stream sedimentation.

11.6.2 Surface Water and Waters of the United States

Moderate impacts on surface water and waters of the United States could occur from increased erosion and stream sedimentation. Disturbance from construction and operation of the tactical infrastructure along with residential and commercial development have the potential for additional erosion and stream sedimentation and adverse cumulative effects. However, as discussed in **Chapter 6.2.3**, a SWPPP and sediment control and storm water BMPs to minimize potential impacts would be developed. Past actions, including sewage, agricultural runoff, and industrial discharges, have generally degraded the quality of water in the Middle Rio Grande basin and have resulted in long-term direct moderate impacts on water quality. The Rio Grande is a CWA Section 303(d) impaired water. Upgrades to existing wastewater facilities and construction of new wastewater facilities in Maverick County, Texas, and Piedras Negras and Ciudad Acuña, Mexico, could produce a moderate beneficial effect on water quality of the Rio Grande.

Wetland losses in the United States have resulted from draining, dredging, filling, leveling, and flooding for urban, agricultural, and residential development. An unknown amount of wetlands could be permanently impacted by construction of the tactical infrastructure. Formal delineation or jurisdictional determination of the extent of wetlands or other waters of the United States has not yet been conducted. The cumulative impacts on wetlands would be long-term and adverse.

11.6.3 Floodplains

Floodplain resources can be adversely impacted by development, increases in impervious areas, loss of vegetation, changes in hydrology, and soil compaction. Construction, operation, and maintenance of tactical infrastructure has the potential for negligible to minor impacts on floodplains from further loss of vegetation, soil compaction on access roads and patrol roads, and the placement of structures in the floodplains. When added to other past, present, and reasonably foreseeable future actions, impacts from the tactical infrastructure would be minor due to the relatively small impact within floodplains. As discussed in **Chapters 1.6** and **6.3.3**, CBP will follow the FEMA process to floodproof the structures and minimize adverse impacts on floodplain resources.

11.7 BIOLOGICAL RESOURCES

11.7.1 Vegetation Resources

Moderate impacts on native species vegetation and habitat and introductions of nonnative species are observable from past and present development and land use and are expected from reasonably foreseeable future actions. Urbanization and agricultural use of the area has directly reduced and modified habitat for common, sensitive, and rare plant species and resulted in the introduction of nonnative species. Indirect impacts from urbanization and agricultural land use include changes in drainage patterns, water quality and volume, and maintenance actions to sustain managed landscapes.

Development of land for urban/industrial use would continue at an unknown pace resulting in continued loss and alteration of plant communities and wildlife habitat. Expansion and upgrade of existing POEs and other border facilities, and construction of the tactical infrastructure would contribute to future development effects.

11.7.2 Wildlife and Aquatic Resources

Minor to moderate effects on wildlife species would be expected from the additive effects of past, present, and reasonably foreseeable future actions. Urbanization of the area has reduced green corridor and water access for wildlife. Cumulative impacts would mainly result from loss of habitat as described in **Chapter 7.2.3**, habitat disturbance and degradation, construction traffic, and permanent loss of green corridors. Displaced wildlife would move to adjacent habitat if sufficient habitat exists. Since residential, commercial, and industrial development has occurred in close proximity (i.e., within several miles) to the infrastructure and such development is projected to continue, the amount of potentially suitable habit is likely to decrease, producing a long-term, minor to moderate adverse cumulative effect. Wildlife could also be adversely impacted by noise during construction, operational lighting, and loss of potential prey species. The permanent lighting could have minor, adverse cumulative impacts on migration, dispersal, and foraging activities of nocturnal species. Species would also be impacted by equipment spills and leaks. Cumulative, adverse impacts on migratory birds could be substantial depending on the time of year of construction of the tactical infrastructure. However, implementation of BMPs presented in **Chapter 7.2.3** could reduce the intensity of such impacts.

11.7.3 Special Status Species

As discussed in **Chapter 7.3.3**, CBP has coordinated closely with the USFWS regarding potential effects on listed species or designated critical habitat. Potential direct and indirect impacts on federally listed species presented in this ESP are based on currently available data.

Threatened and endangered species are commonly protected because their historic range and habitat has been reduced and will only support a small number of individuals. Pedestrian surveys of the project area recorded the presence of only one state-listed species, indigo snake (*Drymarchon corais*); and the presence of potential habitat for the Federal- and state-listed endangered species, ocelot and jaguarundi. Construction, operation, and maintenance of tactical infrastructure, when combined with past, present, and foreseeable future residential and commercial development, has the potential to result in long-term minor to major adverse cumulative impacts on these species. However, the Project will contribute only a small portion of this impact. Potential threats to federally listed species within the impact corridor include trampling (for plants), habitat conversion, and potential changes to ocelot and jaguarundi movements due to loss of corridor habitat and noise.

11.8 CULTURAL RESOURCES

Long-term, moderate to major, adverse impacts on cultural resources are expected from the additive effects of past, present, and reasonably foreseeable future actions. Past, current, and future commercial and residential development, improvements to infrastructure such as highway and water/wastewater projects, and the clearing of land for other development projects have caused significant impacts on cultural resources and can be expected to continue to do so. Cumulative effects on historic properties are expected to be moderate to major, adverse, and long-term.

In compliance with Section 106 of the NHPA, cultural resources surveys were completed to identify and evaluate properties listed on or eligible for listing on the NRHP that might be affected by the tactical infrastructure. Consultation with Native American tribes would ensure that properties of religious and cultural significance to the tribes are addressed. It is anticipated that additional properties determined as eligible for listing in the NRHP will be identified that would be affected. Known historic properties will also be affected.

Impacts on cultural resources (including resources potentially eligible for inclusion in the NRHP) will be avoided, minimized, or reduced through careful planning, siting, and design of the tactical infrastructure and development of special measures. In other cases, special designs could be developed to reduce effects on historic properties.

11.9 SOCIOECONOMIC RESOURCES

Short-term beneficial impacts on local and regional socioeconomic resources would be expected from the additive effects of past, present, and reasonably foreseeable future actions. Economic benefits would be realized by construction companies, their employers and suppliers, and by Val Verde and Maverick counties through a minor increase in tax receipts for the purchase of goods and services. Construction of the tactical infrastructure has the potential for minor beneficial effects from temporary increases in construction jobs and the purchase of goods and services in Val Verde and Maverick counties. Approximately 975 workers are employed in the construction industry in the two counties. An increase of 75 construction jobs will only represent an approximate 8 percent increase of construction jobs, so the cumulative effect will be minimal. Since the construction jobs will be temporary, negligible cumulative effects on population growth, income, or other services will be expected.

Val Verde and Maverick counties have experienced some growth, including residential and commercial development. The permanent conversion of approximately 49 acres to support the tactical infrastructure will be a minimal cumulative impact compared to other development occurring in Val Verde and Maverick counties.

Some privately owned land will be used to support tactical infrastructure, and these affected residents might be adversely impacted by the construction and government purchase of their property.

As discussed in **Chapters 4.3** and **9.3**, some tactical infrastructure will be constructed on or adjacent to private property. Residences and other structures will need to be relocated at some locations along Section M-1, due to their encroachment on the route of the tactical infrastructure. Census Tract 9507 that encompasses Section M-1 has a high percentage of low-income residents. However, the number of structures requiring removal, and the amount of potential low-income residents in close proximity to the impact corridor that will be affected will be low.

Tactical infrastructure for Section M-2A, which has high percentages of minority and low-income residents, will be adjacent to private residences and commercial properties, however relocation will be required. Therefore, while the two affected census tracts do have disproportionately higher minority and low-income residents, the amount of residents that will actually be affected by the Project will be low, and the overall effects of the tactical infrastructure on these populations will be minor.

11.10 UTILITIES AND INFRASTRUCTURE

Residential and commercial development and accompanying population increases in Val Verde and Maverick counties have increased demand for utilities such as drinking water, wastewater treatment, and natural gas and electric power distribution. New infrastructure has been constructed to rehabilitate and upgrade aging infrastructure that is defective and has inadequate capacity. The construction, operation, and maintenance of tactical infrastructure will have minimal demand for utilities and infrastructure, and, therefore, a minimal adverse cumulative effect.

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13. ACRONYMS AND ABBREVIATIONS

μg/m³	micrograms per cubic meter
APE	Area of Potential Effect
AQCR	air quality control region
BLM	Bureau of Land Management
BMP	Best Management Practice
BRP	Biological Resources Plan
CAA	Clean Air Act
CBP	U.S. Customs and Border Protection
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CY	calendar year
dB	decibels
dBA	A-weighted decibels
DHS	U.S. Department of Homeland Security
EA	Environmental Assessment
EO	Executive Order
EPP	Environmental Protection Plan
ESA	Endangered Species Act
ESP	Environmental Stewardship Plan
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
FR	Federal Register
FY	fiscal year
GSA	General Services Administration
hp	horsepower
IIRIRA	Illegal Immigration Reform and Immigrant Responsibility Act
MBTA	Migratory Bird Treaty Act
mg/m³	milligrams per cubic meter
MMTCE	million metric tons of carbon equivalent
MSAI AQCR	Metropolitan San Antonio Intrastate Air Quality Control Region
NAAQS	National Ambient Air Quality Standards
NADB	North American Development Bank
NHL	National Historic Landmark
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NPS	National Park Service
NRCS	Natural Resources Conservation Service

NRHP	National Register of Historic Places
O_3	ozone
OHM	ordinary high water mark
OSHA	Occupational Safety and Health Administration
OSHM	Official State Historic Markers
P.L.	Public Law
Pb	lead
PM_{10}	particle matter equal to or less than 10 microns in diameter
$PM_{2.5}$	particle matter equal to or less than 2.5 microns in diameter
POE	Port of Entry
ppm	parts per million
ROI	Region of Influence
ROW	right-of-way
RTHL	Recorded Texas Historic Landmark
SBI	Secure Border Initiative
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
SR	State route
SWPPP	Storm Water Pollution Prevention Plan
TAAQS	Texas Ambient Air Quality Standards
TARL	Texas Archaeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
TCP	traditional cultural properties
THC	Texas Historical Commission
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
TxDOT	Texas Department of Transportation
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USIBWC	United States Section, International Boundary and Water Commission
VOC	volatile organic compound
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

APPENDIX A

Secretary of Homeland Security, Determination Pursuant to Section 102 of IIRIRA of 1996, as Amended

Vascular Diseases Research; 93.838, Lung Diseases Research; 93.839, Blood Diseases and Resources Research, National Institutes of Health, HHS)

Dated: March 26, 2008.

Jennifer Spaeth,

Director, Office of Federal Advisory Committee Policy.

[FR Doc. E8–6702 Filed 4–2–08; 8:45 am]

BILLING CODE 4140–01–M

DEPARTMENT OF HOMELAND SECURITY

Office of the Secretary

Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as Amended

AGENCY: Office of the Secretary, Department of Homeland Security.

ACTION: Notice of determination.

SUMMARY: The Secretary of Homeland Security has determined, pursuant to law, that it is necessary to waive certain laws, regulations and other legal requirements in order to ensure the expeditious construction of barriers and roads in the vicinity of the international land border of the United States.

DATES: This Notice is effective on April 3, 2008.

Determination and Waiver: I have a mandate to achieve and maintain operational control of the borders of the United States. Public Law 109–367, § 2, 120 Stat. 2638, 8 U.S.C. 1701 note. Congress has provided me with a number of authorities necessary to accomplish this mandate. One of these authorities is found at section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (''IIRIRA''). Public Law 104–208, Div. C, 110 Stat. 3009–546, 3009–554 (Sept. 30, 1996) (8 U.S.C 1103 note), as amended by the REAL ID Act of 2005, Public Law 109–13, Div. B, 119 Stat. 231, 302, 306 (May 11, 2005) (8 U.S.C. 1103 note), as amended by the Secure Fence Act of 2006, Public Law 109–367, § 3, 120 Stat. 2638 (Oct. 26, 2006) (8 U.S.C. 1103 note), as amended by the Department of Homeland Security Appropriations Act, 2008, Public Law 110–161, Div. E, Title V, Section 564, 121 Stat. 2090 (Dec. 26, 2007). In Section 102(a) of IIRIRA, Congress provided that the Secretary of Homeland Security shall take such actions as may be necessary to install additional physical barriers and roads (including the removal of obstacles to detection of illegal entrants) in the vicinity of the United States border to deter illegal crossings in areas of high illegal entry into the United States. In Section 102(b) of IIRIRA, Congress has called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwest border, including priority miles of fencing that must be completed by December 2008. Finally, in section 102(c) of the IIRIRA, Congress granted to me the authority to waive all legal requirements that I, in my sole discretion, determine necessary to ensure the expeditious construction of barriers and roads authorized by section 102 of IIRIRA.

I determine that the areas in the vicinity of the United States border described on the attached document, which is incorporated and made a part hereof, are areas of high illegal entry (collectively ''Project Areas''). These Project Areas are located in the States of California, Arizona, New Mexico, and Texas. In order to deter illegal crossings in the Project Areas, there is presently a need to construct fixed and mobile barriers (such as fencing, vehicle barriers, towers, sensors, cameras, and other surveillance, communication, and detection equipment) and roads in the vicinity of the border of the United States. In order to ensure the expeditious construction of the barriers and roads that Congress prescribed in the IIRIRA in the Project Areas, which are areas of high illegal entry into the United States, I have determined that it is necessary that I exercise the authority that is vested in me by section 102(c) of the IIRIRA as amended.

Accordingly, I hereby waive in their entirety, with respect to the construction of roads and fixed and mobile barriers (including, but not limited to, accessing the project area, creating and using staging areas, the conduct of earthwork, excavation, fill, and site preparation, and installation and upkeep of fences, roads, supporting elements, drainage, erosion controls, safety features, surveillance, communication, and detection equipment of all types, radar and radio towers, and lighting) in the Project Areas, all federal, state, or other laws, regulations and legal requirements of, deriving from, or related to the subject of, the following laws, as amended: The National Environmental Policy Act (Pub. L. 91–190, 83 Stat. 852 (Jan. 1, 1970) (42 U.S.C. 4321 *et seq.*)), the Endangered Species Act (Pub. L. 93–205, 87 Stat. 884 (Dec. 28, 1973) (16 U.S.C. 1531 *et seq.*)), the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) (33 U.S.C. 1251 *et seq.*)), the National Historic Preservation Act (Pub. L. 89–665, 80 Stat. 915 (Oct. 15, 1966) (16 U.S.C. 470 *et seq.*)), the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), the Clean Air Act (42 U.S.C. 7401 *et seq.*), the Archeological Resources Protection Act (Pub. L. 96–95, 16 U.S.C. 470aa *et seq.*), the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*), the Noise Control Act (42 U.S.C. 4901 *et seq.*), the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*), the Archaeological and Historic Preservation Act (Pub. L. 86–523, 16 U.S.C. 469 *et seq.*), the Antiquities Act (16 U.S.C. 431 *et seq.*), the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 *et seq.*), the Wild and Scenic Rivers Act (Pub. L. 90–542, 16 U.S.C. 1281 *et seq.*), the Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*), the Coastal Zone Management Act (Pub. L. 92–583, 16 U.S.C. 1451 *et seq.*), the Wilderness Act (Pub. L. 88–577, 16 U.S.C. 1131 *et seq.*), the Federal Land Policy and Management Act (Pub. L. 94–579, 43 U.S.C. 1701 *et seq.*), the National Wildlife Refuge System Administration Act (Pub. L. 89–669, 16 U.S.C. 668dd–668ee), the Fish and Wildlife Act of 1956 (Pub. L. 84–1024, 16 U.S.C. 742a, *et seq.*), the Fish and Wildlife Coordination Act (Pub. L. 73–121, 16 U.S.C. 661 *et seq.*), the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the Otay Mountain Wilderness Act of 1999 (Pub. L. 106–145), Sections 102(29) and 103 of Title I of the California Desert Protection Act (Pub. L. 103–433), 50 Stat. 1827, the National Park Service Organic Act (Pub. L. 64–235, 16 U.S.C. 1, 2–4), the National Park Service General Authorities Act (Pub. L. 91–383, 16 U.S.C. 1a–1 *et seq.*), Sections 401(7), 403, and 404 of the National Parks and Recreation Act of 1978 (Pub. L. 95–625), Sections 301(a)–(f) of the Arizona Desert Wilderness Act (Pub. L. 101–628), the Rivers and Harbors Act of 1899 (33 U.S.C. 403), the Eagle Protection Act (16 U.S.C. 668 *et seq.*), the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq.*), the American Indian Religious Freedom Act (42 U.S.C. 1996), the Religious Freedom Restoration Act (42 U.S.C. 2000bb), the National Forest Management Act of 1976 (16 U.S.C. 1600 *et seq.*), and the Multiple Use and Sustained Yield Act of 1960 (16 U.S.C. 528–531).

This waiver does not supersede, supplement, or in any way modify the previous waivers published in the **Federal Register** on September 22, 2005 (70 FR 55622), January 19, 2007 (72 FR

2535), and October 26, 2007 (72 FR 60870).

I reserve the authority to make further waivers from time to time as I may determine to be necessary to accomplish the provisions of section 102 of the IIRIRA, as amended.

Dated: April 1, 2008.

Michael Chertoff,

Secretary.

[FR Doc. 08–1095 Filed 4–1–08; 2:03 pm]

BILLING CODE 4410–10–P

DEPARTMENT OF HOMELAND SECURITY

Office of the Secretary

Determination Pursuant to Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as Amended

AGENCY: Office of the Secretary, Department of Homeland Security.

ACTION: Notice of determination.

SUMMARY: The Secretary of Homeland Security has determined, pursuant to law, that it is necessary to waive certain laws, regulations and other legal requirements in order to ensure the expeditious construction of barriers and roads in the vicinity of the international land border of the United States.

DATES: This Notice is effective on April 3, 2008.

Determination and Waiver: The Department of Homeland Security has a mandate to achieve and maintain operational control of the borders of the United States. Public Law 109–367, Section 2, 120 Stat. 2638, 8 U.S.C. 1701 note. Congress has provided the Secretary of Homeland Security with a number of authorities necessary to accomplish this mandate. One of these authorities is found at section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (''IIRIRA''). Public Law 104–208, Div. C, 110 Stat. 3009–546, 3009–554 (Sept. 30, 1996) (8 U.S.C 1103 note), as amended by the REAL ID Act of 2005, Public Law 109–13, Div. B, 119 Stat. 231, 302, 306 (May 11, 2005) (8 U.S.C. 1103 note), as amended by the Secure Fence Act of 2006, Public Law 109–367, Section 3, 120 Stat. 2638 (Oct. 26, 2006) (8 U.S.C. 1103 note), as amended by the Department of Homeland Security Appropriations Act, 2008, Public Law 110–161, Div. E, Title V, Section 564, 121 Stat. 2090 (Dec. 26, 2007). In Section 102(a) of the IIRIRA, Congress provided that the Secretary of Homeland Security shall take such actions as may be necessary to install additional physical barriers and roads (including the removal of obstacles to detection of illegal entrants) in the vicinity of the United States border to deter illegal crossings in areas of high illegal entry into the United States. In Section 102(b) of the IIRIRA, Congress has called for the installation of fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of the southwest border, including priority miles of fencing that must be completed by December of 2008. Finally, in section 102(c) of the IIRIRA, Congress granted to me the authority to waive all legal requirements that I, in my sole discretion, determine necessary to ensure the expeditious construction of barriers and roads authorized by section 102 of the IIRIRA.

I determine that the area in the vicinity of the United States border as described in the attached document, hereinafter the Project Area, which is incorporated and made a part hereof, is an area of high illegal entry. In order to deter illegal crossings in the Project Area, there is presently a need to construct fixed and mobile barriers and roads in conjunction with improvements to an existing levee system in the vicinity of the border of the United States as a joint effort with Hidalgo County, Texas. In order to ensure the expeditious construction of the barriers and roads that Congress prescribed in the IIRIRA in the Project Area, which is an area of high illegal entry into the United States, I have determined that it is necessary that I exercise the authority that is vested in me by section 102(c) of the IIRIRA as amended. Accordingly, I hereby waive in their entirety, with respect to the construction of roads and fixed and mobile barriers (including, but not limited to, accessing the project area, creating and using staging areas, the conduct of earthwork, excavation, fill, and site preparation, and installation and upkeep of fences, roads, supporting elements, drainage, erosion controls, safety features, surveillance, communication, and detection equipment of all types, radar and radio towers, and lighting) in the Project Area, all federal, state, or other laws, regulations and legal requirements of, deriving from, or related to the subject of, the following laws, as amended: The National Environmental Policy Act (Pub. L. 91–190, 83 Stat. 852 (Jan. 1, 1970) (42 U.S.C. 4321 *et seq.*)), the Endangered Species Act (Pub. L. 93–205, 87 Stat. 884) (Dec. 28, 1973) (16 U.S.C. 1531 *et seq.*)), the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) (33 U.S.C. 1251 *et seq.*), the National Historic Preservation Act (Pub. L. 89–665, 80 Stat. 915 (Oct. 15, 1966) (16 U.S.C. 470 *et seq.*)), the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), the Clean Air Act (42 U.S.C. 7401 *et seq.*), the Archeological Resources Protection Act (Pub. L. 96–95, 16 U.S.C. 470aa *et seq.*), the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*), the Noise Control Act (42 U.S.C. 4901 *et seq.*), the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*), the Archaeological and Historic Preservation Act (Pub. L. 86–523, 16 U.S.C. 469 *et seq.*), the Antiquities Act (16 U.S.C. 431 *et seq.*), the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 *et seq.*), the Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*), the Coastal Zone Management Act (Pub. L. 92–583, 16 U.S.C. 1451 *et seq.*), the Federal Land Policy and Management Act (Pub L. 94–579, 43 U.S.C. 1701 *et seq.*), the National Wildlife Refuge System Administration Act (Pub. L. 89–669, 16 U.S.C. 668dd–668ee), the Fish and Wildlife Act of 1956 (Pub. L. 84–1024, 16 U.S.C. 742a, *et seq.*), the Fish and Wildlife Coordination Act (Pub. L. 73–121, 16 U.S.C. 661 *et seq.*), the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the Rivers and Harbors Act of 1899 (33 U.S.C. 403), the Eagle Protection Act (16 U.S.C. 668 *et seq.*), the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq.*), the American Indian Religious Freedom Act (42 U.S.C. 1996), the Religious Freedom Restoration Act (42 U.S.C. 2000bb), and the Federal Grant and Cooperative Agreement Act of 1977 (31 U.S.C. 6303–05).

I reserve the authority to make further waivers from time to time as I may determine to be necessary to accomplish the provisions of section 102 of the IIRIRA, as amended.

Dated: April 1, 2008.

Michael Chertoff,

Secretary.

[FR Doc. 08–1096 Filed 4–1–08; 2:03 pm]

BILLING CODE 4410–10–P

APPENDIX B

Standard Design for Tactical Infrastructure

Appendix B

Standard Design for Tactical Infrastructure

A properly designed tactical infrastructure system is an indispensable tool in deterring those attempting to illegally cross the U.S. border. Tactical infrastructure is also integral to maintaining USBP's flexibility in deploying agents and enforcement operations. A formidable infrastructure acts as a force multiplier by slowing down illegal entrants and increasing the window of time that agents have to respond. Strategically developed tactical infrastructure should enable USBP managers to better utilize existing manpower when addressing the dynamic nature of terrorists, illegal aliens, and narcotics trafficking (INS 2002).

USBP apprehension statistics remain the most reliable way to codify trends in illegal migration along the border. Based on apprehension statistics, in a 2006 report on border security, the Congressional Research Service concluded that "the installation of border fencing, in combination with an increase in agent manpower and technological assets, has had a significant effect on the apprehensions made in the San Diego sector" (CRS 2006).

Since effective border enforcement requires adequate scope, depth, and variety in enforcement activity, any single border enforcement function that significantly depletes USBP's ability to satisfactorily address any other enforcement action creates exploitable opportunities for criminal elements. For example, the intense deployment of personnel resources necessary to monitor urban border areas without tactical infrastructure adversely affects the number of agents available for boat patrol, transportation check points, patrolling remote border areas, and other tasks. Tactical infrastructure reduces this effect by reinforcing critical areas, allowing the agents to be assigned to other equally important border enforcement roles (INS 2002).

Fencing

The tactical infrastructure design that meets the USBP Del Rio Sector's operational needs are primary pedestrian fence with an aesthetic quality (Section M-1 and M-2A) and a concrete retaining wall (Section M-2A only). **Figure B-1** is an example of primary pedestrian fence with an aesthetic quality.

Patrol Roads

Patrol roads provide USBP agents with quick and direct access to anyone conducting illegal activity along the border, and allow agents access to the various components of the tactical infrastructure system. Patrol roads typically run parallel to and a few feet north of the pedestrian fence. Patrol roads are typically unpaved, but in some cases "all-weather" roads are necessary to ensure continual USBP access (INS 2002).

Figure B-1. Aesthetic-Style Fence

Lighting

Two types of lighting (permanent and portable) might be constructed in specific urban locations. Each light pole will be placed approximately 100 yards apart, and will be placed so that the riparian corridor will not be illuminated. Illegal entries are often accomplished by using the cover of darkness, which would be eliminated by lighting. Lighting acts as a deterrent to cross-border violators and as an aid to USBP agents in capturing illegal aliens, smugglers, terrorists, or terrorist weapons after they have entered the United States (INS 2001). Lighting locations are determined by USBP based on emergent or projected operational needs of the specific area.

The permanent lighting would be stadium-type lights on approximately 30- to 40-foot high poles with two to four lights per pole. Each light would have a range of 400 to 1,000 watts, with lower-wattage bulbs used where feasible. Wooden poles, encased in concrete and steel culvert pipe to prevent them from being cut down, would most often be used, although steel poles with concrete footings might also be used. The poles might be existing poles or they might need to be installed. Electricity would be run in overhead lines unless local regulations require the lines to be underground (DHS 2004). Lights would operate from dusk to dawn. Light poles adjacent to USIBWC levees will be coordinated with and approved by the USIBWC. The final placement and direction of lighting has been and will continue to be coordinated with the USFWS.

Portable lights are self-contained units with generators that can be quickly moved to meet USBP operational requirements. Portable lights are powered by a 6-kilowatt self-contained diesel generator. Portable lights would generally operate continuously every night and would require refueling every day prior to the next night's operation. The portable light systems can be towed to the desired location by USBP vehicles, but they are typically spaced approximately 100 to 400 feet apart, depending upon topography and operational needs. Each portable light would have a light fan directed toward the fence to produce an illuminated area of 100 ft^2. The lighting systems would have shields placed over the lamps to reduce or eliminate the effects of backlighting. Effects from the lighting would occur along the entire corridor where they could be placed; however, in reality, only parts of the fence would be illuminated at a given time since the portable lights would be periodically relocated to provide the most effective deterrent and enforcement strategy (INS 2001).

References

CRS 2006 — Congressional Research Service (CRS). 2006. "Report For Congress." *Border Security: Barriers Along the U.S. International Border*. 12 December 2006.

DHS 2004 — U.S. Department of Homeland Security (DHS). 2004. *Environmental Impact Statement for Operation Rio Grande*. CBP, Washington D.C. April 2004.

INS 2001 — Immigration and Naturalization Service (INS). 2001. *Final Environmental Assessment, Portable Lights within the Naco Corridor*. Cochise County, Arizona. December 2001.

INS 2002 — Immigration and Naturalization Service (INS). 2002. *Draft Environmental Impact Statement for the Completion of the 14-Mile Border Infrastructure System, San Diego, CA*. Immigration and naturalization Service. January 2002

APPENDIX C

Air Quality Information

APPENDIX C

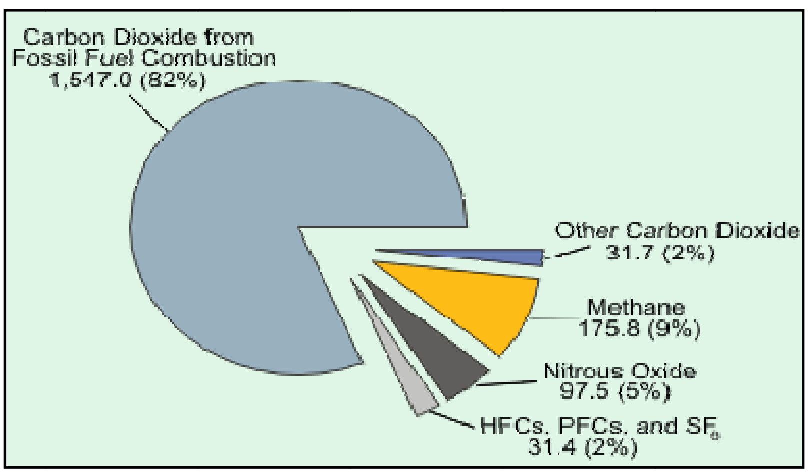
AIR QUALITY EMISSIONS CALCULATIONS

Greenhouse Gases

In April 2007, the U.S. Supreme Court declared that carbon dioxide (CO_2) and other greenhouse gases are air pollutants under the Clean Air Act (CAA). The Court declared that the U.S. Environmental Protection Agency (USEPA) has the authority to regulate emissions from new cars and trucks under the landmark environment law.

Many chemical compounds found in the Earth's atmosphere act as "greenhouse gases." These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Over time, the trapped heat results in the phenomenon of global warming.

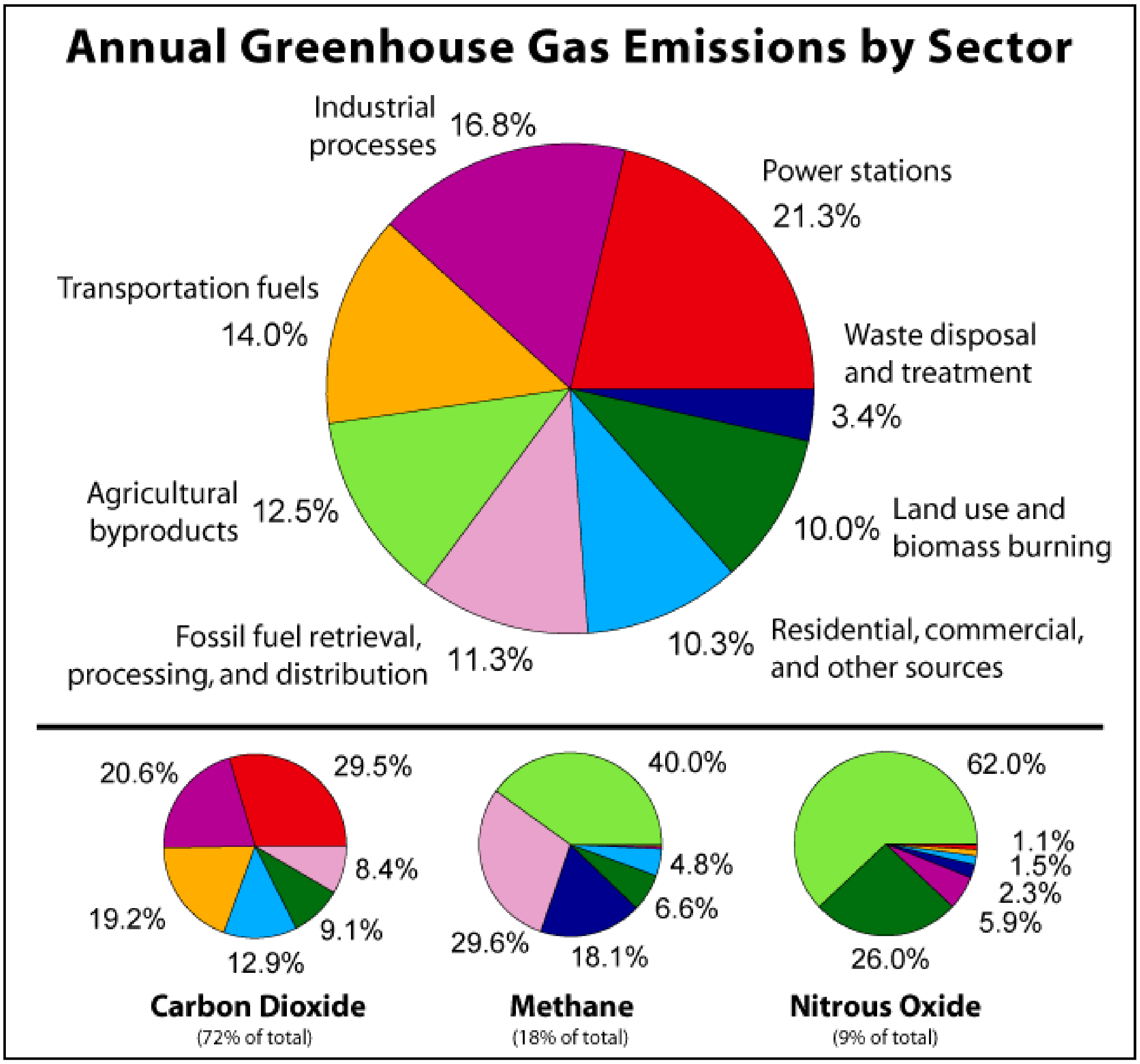
Many gases exhibit these "greenhouse" properties. The sources of the majority of greenhouse gases come mostly from natural sources but are also contributed to by human activity and are shown in **Figure C-1**. It is not possible to state that a specific gas causes a certain percentage of the greenhouse effect because the influences of the various gases are not additive.



Source: Energy Information Administration 2003

Figure C-1. Greenhouse Gas Emissions From Burning of Gas (Million Metric Tons of Carbon Equivalent)

Figure C-2 displays the annual greenhouse gas emissions by sector in the United States. Most government agencies and military installations are just beginning to establish a baseline for their operations and their impact on the greenhouse effect. Since the USEPA has not promulgated an ambient standard or *de minimis* level for CO_2 emissions for Federal actions, there is no standard value to compare an action against in terms of meeting or violating the standard.



Source: Rosmarino 2006

Figure C-2. Annual Greenhouse Gas Emissions by Sector

References

Energy Information Administration. 2003. "Greenhouse Gases, Climate Change, and Energy." EIA Brochure. 2003. Available online: <*http://www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html*>. Last updated April 2, 2004. Accessed November 4, 2007.

Tanyalynnette Rosmarino, Director of Field Engineering, Northeast, BigFix, Inc. 2006. "A Self-Funding Enterprise Solution to Reduce Power Consumption and Carbon Emissions." Slide presentation for the NYS Forum's May Executive Committee Meeting Building an Energy Smart IT Environment. 2006. Available online: <*http://www.nysforum.org/documents/html/2007/execcommittee/may/enterprisepowerconsumptionreduction_files/800x600/slide1.html*>. Accessed November 4, 2007.

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Summary	Summarizes total emissions by calendar year.
Combustion	Estimates emissions from non-road equipment exhaust as well as painting.
Fugitive	Estimates fine particulate emissions from earthmoving, vehicle traffic, and windblown dust
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions
Maintenance Emissions	Estimates the total emissions from future maintenance of fencelines and access roads from mowers.
Generator Emissions	Estimates the total emissions from emergency generators to power construction equipment.
AQCR Tier Report	Summarizes total emissions for the Metropolitan San Antonio Intrastate AQCR Tier Reports for 2001, to be used to compare project to regional emissions.

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Construction Combustion Emissions for CY 2008

Combustion Emissions of VOC, NO_x, SO_2, CO and PM_{10} Due to Construction

Includes:

100% of Construct Pedestrian Fences and Patrol Road	1,241,856 ft^2	28.51 acres
Construction area planned per month	310,464 ft^2	7.13 acres

Assumptions:

Total ground disturbance for pedestrian fence and patrol road would be 3.92 miles long by 60 feet wide (1,241,856 ft^2).
No grading would be required in construction staging areas.
Patrol road would be graded and lined with gravel. No paving would be included in the Project.
Construction would occur between April and July 2008 for a total of 120 working days (Assumes working 7 days/week).

Total Building Construction Area:	0 ft^2	
Total Demolished Area:	0 ft^2	
Total Paved Area:	0 ft^2	
Total Disturbed Area per month:	310,464 ft^2	7.13 acres
Construction Duration:	0.3 year(s)	
Annual Construction Activity:	120 days/yr	

Emission Factors Used for Construction Equipment

Reference: Guide to Air Quality Assessment, SMAQMD, 2004

Emission factors are taken from Table 3-2. Assumptions regarding the type and number of equipment are from Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Bulldozer	1	29.40	3.66	25.09	0.59	1.17
Motor Grader	1	10.22	1.76	14.98	0.20	0.28
Water Truck	1	20.89	3.60	30.62	0.42	0.58
Total per 10 acres of activity	3	60.51	9.02	70.69	1.21	2.03

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Paver	1	7.93	1.37	11.62	0.16	0.22
Roller	1	5.01	0.86	7.34	0.10	0.14
Total per 10 acres of activity	2	12.94	2.23	18.96	0.26	0.36

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Loader	1	7.86	1.35	11.52	0.16	0.22
Haul Truck	1	20.89	3.60	30.62	0.42	0.58
Total per 10 acres of activity	2	28.75	4.95	42.14	0.58	0.80

Building Construction

Equipment[d]	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Stationary						
Generator Set	1	11.83	1.47	10.09	0.24	0.47
Industrial Saw	1	17.02	2.12	14.52	0.34	0.68
Welder	1	4.48	0.56	3.83	0.09	0.18
Mobile (non-road)						
Truck	1	20.89	3.60	30.62	0.84	0.58
Forklift	1	4.57	0.79	6.70	0.18	0.13
Crane	1	8.37	1.44	12.27	0.33	0.23
Total per 10 acres of activity	6	67.16	9.98	78.03	2.02	2.27

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)
Air Compressor	1	6.83	0.85	5.82	0.14	0.27
Total per 10 acres of activity	1	6.83	0.85	5.82	0.14	0.27

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activitiy, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.

b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC.

c) The SMAQMD 2004 reference does not provide SO_2 emission factors. For this worksheet, SO_2 emissions have been estimated based on approximate fuel use rate for diesel equipment and the assumption of 500 ppm sulfur diesel fuel. For the average of the equipment fleet, the resulting SO_2 factor was found to be approximately 0.04 times the NOx emission factor for the mobile equipment (based upon 2002 USAF IERA "Air Emissions Inventory Guidance") and 0.02 times the NOx emission factor for all other equipment (based on AP-42, Table 3.4-1)

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	SMAQMD Emission Factors (lb/day)				
		NO_x	VOC	CO	SO_2**	PM_{10}
Grading Equipment	1	43.127	6.429	50.383	0.863	1.447
Paving Equipment	1	0.000	0.000	0.000	0.000	0.000
Demolition Equipment	1	0.000	0.000	0.000	0.000	0.000
Building Construction	1	0.000	0.000	0.000	0.000	0.000
Air Compressor for Architectural Coating	1	0.000	0.000	0.000	0.000	0.000
Architectural Coating**			0.000			

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 ac*((total disturbed area/43560)/10))*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	310,464	7.13	6	(from "CY2008 Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating	0	0.00	0	(per the SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative.
The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition.
The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Project Emissions per Month (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}
Grading Equipment	258.76	38.57	302.30	5.18	8.68
Paving	-	-	-	-	-
Demolition	-	-	-	-	-
Building Construction	-	-	-	-	-
Architectural Coatings	-	-	-	-	-
Total Emissions (lbs):	**258.76**	**38.57**	**302.30**	**5.18**	**8.68**

Results: Total Project Annual Emissions (4 months of activity)

	NO_x	VOC	CO	SO_2	PM_{10}
Total Project Emissions (lbs)	1,035.05	154.29	1,209.18	20.70	34.72
Total Project Emissions (tons)	0.52	0.08	0.60	0.01	0.02

CO2 Emissions

Construction Fugitive Dust Emissions for CY 2008

Calculation of PM_{10} Emissions Due to Site Preparation (Uncontrolled).

User Input Parameters / Assumptions

Acres graded per year:	28.51	acres/yr	(From "CY2008 Combustion" worksheet)
Grading days/yr:	5.59	days/yr	(From "CY2008 Grading worksheet)
Exposed days/yr:	45	assumed days/yr graded area is exposed	
Grading Hours/day:	8	hr/day	
Soil piles area fraction:	0.10	(assumed fraction of site area covered by soil piles)	
Soil percent silt, s:	8.5	%	(mean silt content; expected range: 0.56 to 23, AP-42 Table 13.2.2-1)
Soil percent moisture, M:	85	%	(http://www.cpc.noaa.gov/products/soilmst/w.shtml)
Annual rainfall days, p:	70	days/yr rainfall exceeds 0.01 inch/day (AP-42 Fig 13.2.2-1)	
Wind speed > 12 mph %, I:	17	%	Ave. of wind speed at San Antonio, TX (http://www.epa.gov/ttn/naaqs/ozone/areas/windr/12921.gif)
Fraction of TSP, J:	0.5	per California Environmental Quality Act (CEQA) Air Quality Handbook, SCAQMD, 1993, p. A9-99	
Mean vehicle speed, S:	5	mi/hr	(On-site)
Dozer path width:	8	ft	
Qty construction vehicles:	8.55	vehicles	(From "CY2008 Grading worksheet)
On-site VMT/vehicle/day:	5	mi/veh/day	(Excluding bulldozer VMT during grading)
PM_{10} Adjustment Factor k	1.5	lb/VMT	(AP-42 Table 13.2.2-2 12/03 for PM_{10} for unpaved roads)
PM_{10} Adjustment Factor a	0.9	(dimensionless)	(AP-42 Table 13.2.2-2 12/03 for PM_{10} for unpaved roads)
PM_{10} Adjustment Factor b	0.45	(dimensionless)	(AP-42 Table 13.2.2-2 12/03 for PM_{10} for unpaved roads)
Mean Vehicle Weight W	40	tons	assumed for aggregate trucks

TSP - Total Suspended Particulate
VMT - Vehicle Miles Traveled

Emissions Due to Soil Disturbance Activities

Operation Parameters (Calculated from User Inputs)

Grading duration per acre	1.6	hr/acre	
Bulldozer mileage per acre	1	VMT/acre	(Miles traveled by bulldozer during grading)
Construction VMT per day	43	VMT/day	
Construction VMT per acre	8.4	VMT/acre	(Travel on unpaved surfaces within site)

Equations Used (Corrected for PM10)

Operation	Empirical Equation	Units	AP-42 Section (5th Edition)
Bulldozing	$0.75(s^{1.5})/(M^{1.4})$	lbs/hr	Table 11.9-1, Overburden
Grading	$(0.60)(0.051)s^{2.0}$	lbs/VMT	Table 11.9-1,
Vehicle Traffic (unpaved roads)	$[(k(s/12)^{a}(W/3)^{b})]\ [(365-P)/365]$	lbs/VMT	Section 13.2.2

Source: Compilation of Air Pollutant Emission Factors, Vol. I, USEPA AP-42, Section 11.9 dated 10/98 and Section 13.2 dated 12/03

Calculation of PM_{10} Emission Factors for Each Operation

Operation	Emission Factor (mass/ unit)		Operation Parameter		Emission Factor (lbs/ acre)	
Bulldozing	0.04	lbs/hr	1.6	hr/acre	0.10	lbs/acre
Grading	0.77	lbs/VMT	1	VMT/acre	0.80	lbs/acre
Vehicle Traffic (unpaved roads)	2.85	lbs/VMT	8.4	VMT/acre	24.00	lbs/acre

Emissions Due to Wind Erosion of Soil Piles and Exposed Graded Surface

Reference: California Environmental Quality Act (CEQA) Air Quality Handbook, SCAQMD, 1993.

Soil Piles EF = 1.7(s/1.5)[(365 - p)/235](I/15)(J) = (s)(365 - p)(I)(J)/(3110.2941), p. A9-99.

Soil Piles EF = 6.9 lbs/day/acre covered by soil piles

Consider soil piles area fraction so that EF applies to graded area

Soil piles area fraction: 0.10 (Fraction of site area covered by soil piles)
Soil Piles EF = 0.69 lbs/day/acres graded

Graded Surface EF = 26.4 lbs/day/acre (recommended in CEQA Manual, p. A9-93).

Calculation of Annual PM_{10} Emissions

Source	Emission Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing	0.10	lbs/acre	28.51	NA	3	0.001
Grading	0.80	lbs/acre	28.51	NA	23	0.011
Vehicle Traffic	24.00	lbs/acre	28.51	NA	684	0.342
Erosion of Soil Piles	0.69	lbs/acre/day	28.51	45	885	0.443
Erosion of Graded Surface	26.40	lbs/acre/day	28.51	45	33,869	16.934
TOTAL					35,464	17.73

Soil Disturbance EF: 24.90 lbs/acre
Wind Erosion EF: 27.09 lbs/acre/day

Back calculate to get EF: 222.71 lbs/acre/grading day

Construction (Grading) Schedule for CY 2008

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 28.51 acres/yr (from "CY2008 Combustion" Worksheet)

Qty Equipment: 8.55 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	28.51	3.56
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	28.51	13.94
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	14.25	14.37
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	14.25	5.90
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	28.51	10.00
TOTAL								47.77

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 47.77
Qty Equipment: 8.55
Grading days/yr: 5.59

Maintenance Activities Emissions for CY 2008

Combustion Emissions of VOC, NO_x, SO_2, CO and PM_{10} Due to Maintenance Activities

The fenceline and access road would require mowing approximately two times per year to maintain vegetation height and allow enhanced visibility and security.

Assumptions:
Approximately 28.51 acres of land would be mowed twice per year.
Two agricultural mowers (40 horsepower) would operate for approximately 14 days.
Each working day would be 8 hours.
Agricultural mowers operate at 43% load capacity (17.2 horsepower).

Emission Factors Used for Maintenance Equipment

Reference: USAF IERA "Air Emissions Inventory Guidance", July 2001, Table 7-6. Criteria Pollutant Emission Factors for Nonroad Diesel Engines.

Emission Factors

Equipment	Rated Power (hp)	Loading Factor (% of Max Power)	Operating Time (hr/yr)	BSFC (lb/hp-hr)	NO_x (g/hp-hr)	VOC (g/hp-hr)	CO (g/hp-hr)	SO_2 (g/hp-hr)	PM_{10} (g/hp-hr)
Agricultural Mower (Diesel)	40	43	224	0.408	5.0	0.6	2.5	1.19	0.6

BSFC = Brake Specific Fuel Consumption

Results: Total Maintenance Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}
Total Maintenance Emissions (lbs)	84.954	10.195	42.477	20.219	10.195
Total Maintenance Emissions (tons)	0.042	0.005	0.021	0.010	0.005

Example:
Total Maintenance Emissions (lbs of NO_x) =
(Rated power output of equipment engine)*(Loading Factor/100)*(Operating Time)*(Number of Equipment)*(Emission Factor)*(Conversion factor)

Total Maintenance Emissions (lbs of NO_x) = (40 hp)*(43/100)*(224 hr/yr)*(2 Equipment)*(5.0 g/hp-hr)*(0.002205 lb/g) = 84.95 lbs/yr

Emissions from Diesel Powered Generators for Construction Equipment

The Project would require six diesel powered generators to power construction equipment. These generators would operate approximately 8 hours per day for 120 working days.

Number of Generators	6	
Maximum Hours of Operation	8	hrs/day
Number of Construction Days	120	

Total Generator Capacity	75	hp
Hourly Rate	0.5262	MMBtu/hr
Annual Use	3,031	MMBtu/yr

Example: 1hp=0.002546966 MMBtu/Hr
Hourly Rate (MMBtu) = (75 Hp/0.363)*(0.002546699 MMBtu/hr) =0.5262 MMBtu/hr
Annual Use (MMBtu) = (Number of Generator * Hours Operation/Day * Number of Construction Days) = (6*8*120*0.5262) = 3,030.9 MMBtu/yr

Note: Generators horsepower output capacity is only 0.363 percent efficient (AP-42 Chapter 3.3).
Source: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Generator Emission Factors (Diesel)

NO_x	4.41	lb/MMBtu
VOC	0.36	lb/MMBtu
CO	0.95	lb/MMBtu
SO_x	0.29	lb/MMBtu
PM_{10}	0.31	lb/MMBtu

Emissions (Diesel)

NO_x	6.683	tpy
VOC	0.546	tpy
CO	1.440	tpy
SO_x	0.439	tpy
PM_{10}	0.470	tpy

Example: Total NOx Emissions = (Annual MMBtu/year*(EF)/2000 = (3,030.9*4.41)/2000 = 6.68 tpy

Source: Emission Factors: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Emissions from Diesel Powered Generators for Portable Lights

The Project would require 10 portable light units to meet USBP operational requirements. These portable lights are powered by a 6-kilowatt self-contained diesel generators. Portable lights would generally operate continuously every night (approximately 12 hours) 365 days per year.

Number of Generators	10	
Maximum Hours of Operation	12	hrs/day
Number of Operational Days	120	
Total Generator Capacity	6	hp
Hourly Rate	0.0421	MMBtu/hr
Annual Use	606	MMBtu/yr

Example: 1hp=0.002546966 MMBtu/Hr
Hourly Rate (MMBtu) = (6 Hp/0.363)*(0.002546699 MMBtu/hr) =0.0421 MMBtu/hr
Annual Use (MMBtu) = (Number of Generator * Hours Operation/Day * Number of Construction Days) = (10*12*120*0.0421) = 606.2MMBtu/yr

Note: Generators horsepower output capacity is only 0.363 percent efficient (AP-42 Chapter 3.3).
Source: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

Generator Emission Factors (Diesel)

NO_x	4.41	lb/MMBtu
VOC	0.36	lb/MMBtu
CO	0.95	lb/MMBtu
SO_x	0.29	lb/MMBtu
PM_{10}	0.31	lb/MMBtu

Emissions (Diesel)

NO_x	1.337	tpy
VOC	0.109	tpy
CO	0.288	tpy
SO_x	0.088	tpy
PM_{10}	0.094	tpy

Example: Total NOx Emissions = (Annual MMBtu/year*(EF)/2000 = (606*4.41)/2000 = 1.337 tpy

Source: Emission Factors: USEPA AP-42 Volume I, Stationary Internal Combustion Sources, Table 3.3-1 (http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf)

CO2 Emissions

0.140 MMBTU/gallons of diesel fuel used
3,606 MMBTU/Year*gallons/0.140 = 25,757 gallons
25,757 gallons*21.3 pounds CO2/gallon = 548,624 pounds
548,624/2000 = 274 tons/year

Metropolitan San Antonio Intrastate Air Quality Control Region

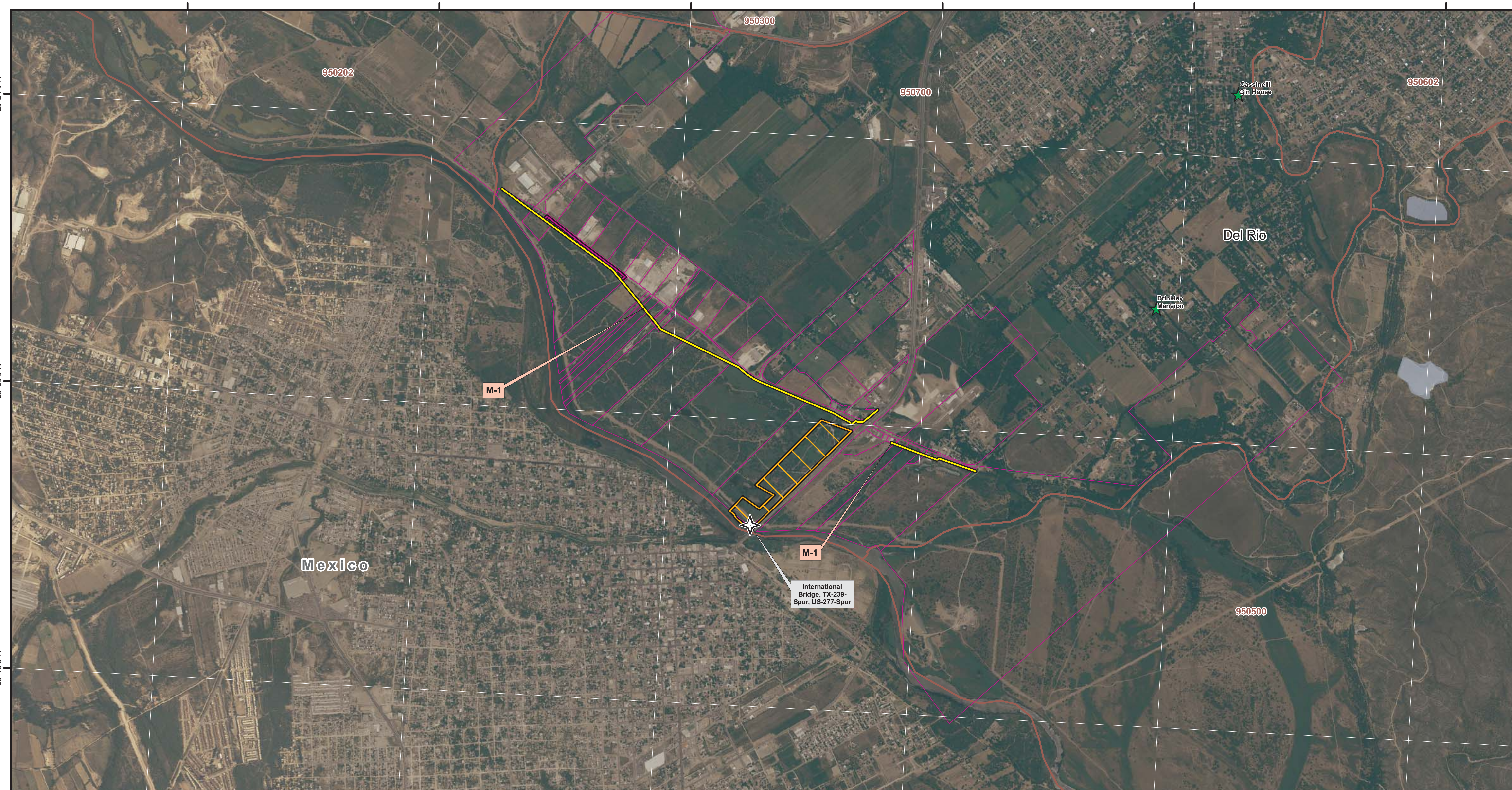
			Area Source Emissions						Point Source Emissions					
Row # SORT	State	County	CO	NOx	PM10	PM2.5	SO2	VOC	CO	NOx	PM10	PM2.5	SO2	VOC
1	TX	Atascosa Co	17,009	2,742	9,974	1,814	157	4,814	705	7,664	2,051	1,567	15,987	185
2	TX	Bandera Co	6,260	627	5,554	1,008	38.3	1,100	32.4	234	0	0	0	14.3
3	TX	Bexar Co	426,880	43,688	59,970	13,679	2,634	64,911	4,544	19,916	4,103	2,549	28,324	1,336
4	TX	Comal Co	27,725	3,251	9,634	1,932	201	3,894	2,490	5,024	507	287	120	220
5	TX	Dimmit Co	4,546	418	2,815	574	36.3	877	146	240	0.12	0.11	21.2	28.4
6	TX	Edwards Co	3,909	270	1,825	516	381	552	23.8	15.5	0.03	0.03	0	7.15
7	TX	Frio Co	11,648	1,888	4,122	846	103	2,474	95.7	260	16.6	12	379	31.1
8	TX	Gillespie Co	8,917	1,079	5,918	1,078	64.4	1,210	0	0	0	0	0	0
9	TX	Guadalupe Co	34,281	5,277	17,912	3,241	249	7,853	375	114	103	88.2	51.9	99.1
10	TX	Karnes Co	3,243	405	4,506	844	36.7	1,169	149	649	0.59	0.58	343	257
11	TX	Kendall Co	10,599	1,340	5,916	1,085	69.4	1,394	0	0	0	0	0	0.64
12	TX	Kerr Co	22,083	2,448	9,693	1,720	132	2,793	0	0	0	0	0	0
13	TX	Kinney Co	2,680	608	1,984	444	43.9	279	0	0	0	0	0	0
14	TX	La Salle Co	11,437	2,129	1,921	492	111	1,310	0	0	0	0	0	0
15	TX	Maverick Co	14,065	1,714	8,524	1,543	109	2,254	0	0	0	0	0	0
16	TX	Medina Co	17,175	3,174	10,562	1,944	191	5,179	0	0	0	0	0	0
17	TX	Real Co	1,869	139	1,621	339	13.3	307	0	0	0	0	0	0
18	TX	Uvalde Co	9,374	1,982	6,792	1,380	140	1,789	0	0	129	26.7	0	103
19	TX	Val Verde Co	14,146	1,905	3,649	912	152	2,726	0	0	0	0	0	0
20	TX	Wilson Co	11,757	1,622	9,752	1,712	94.1	2,023	0	0	0	0	0	0
21	TX	Zavala Co	3,705	373	2,950	617	37.9	947	0	0	0	0	0	0
Grand Total			663,308	77,079	185,594	37,720	4,994	109,855	8,561	34,117	6,910	4,531	45,226	2,282

SOURCE:
http://www.epa.gov/air/data/geosel.html
USEPA - AirData NET Tier Report
*Net Air pollution sources (area and point) in tons per year (2001)
Site visited on 13 November 2007.

Metropolitan San Antonio Intrastate AQCR (40 CFR 81.40):
In the State of Texas: Atascosa County, Bandera County, Bexar County, Comal County, Dimmit County, Edwards County, Frio County, Gillespie County, Guadalupe County, Karnes County, Kendall County, Kerr County, Kinney County, La Salle County, Maverick County, Medina County, Real County, Uvalde County, Val Verde County, Wilson County, and Zavala County

APPENDIX D

Detailed Maps of Fence Sections



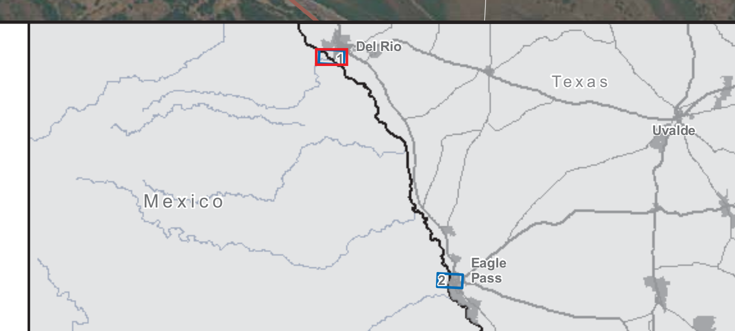
Fence Sections
Access Roads
Staging Areas *
Land Parcels
Census Tracts
Historic Property
Historic District
Brush Clearing
Port of Entry
Surface Water

Feet

0 500 1,000 2,000

Scale

N

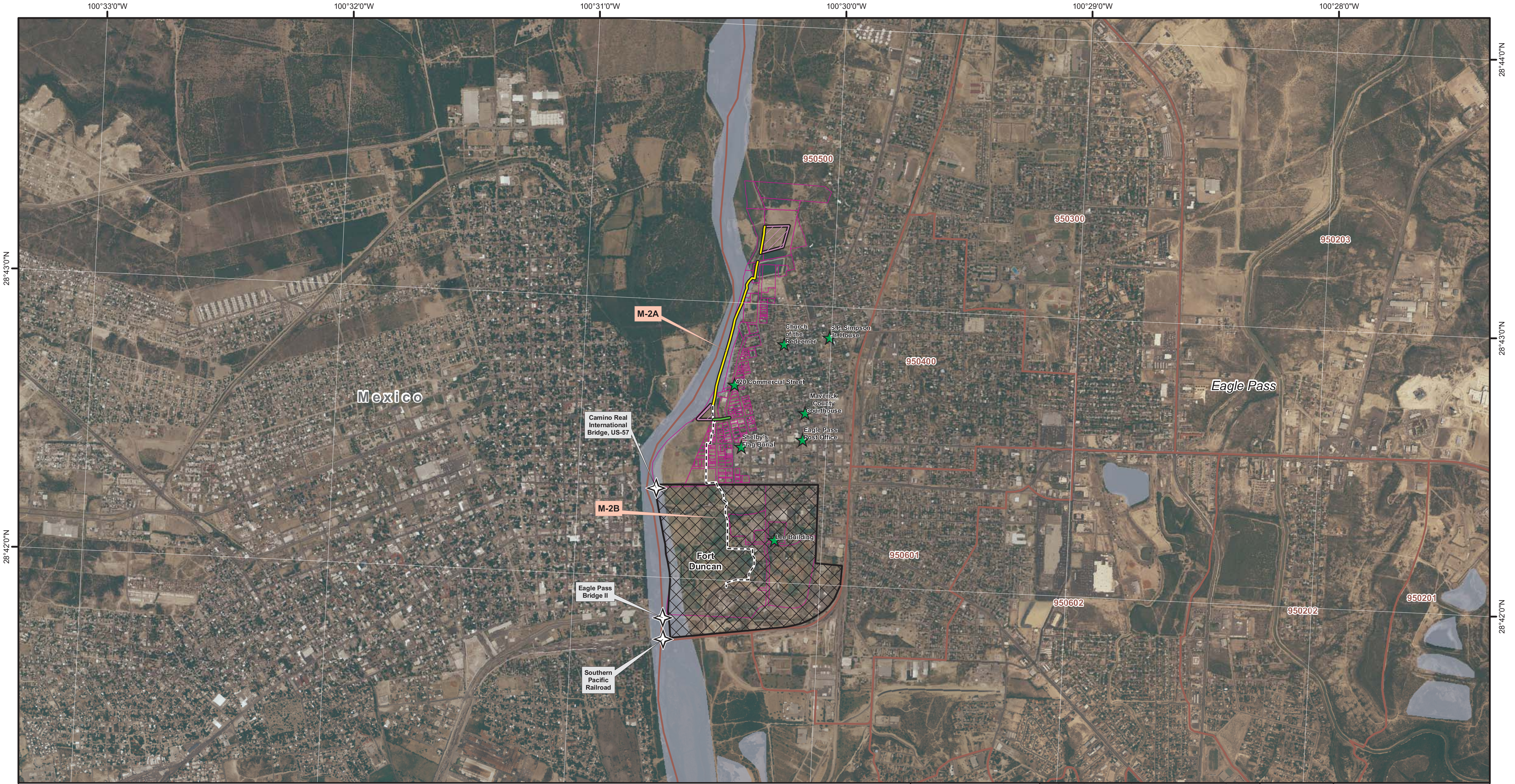


Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Del Rio Sector, Texas Detailed Fence Section Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 20, 2008	Scale 1" = 2000'	Map 1 of 2

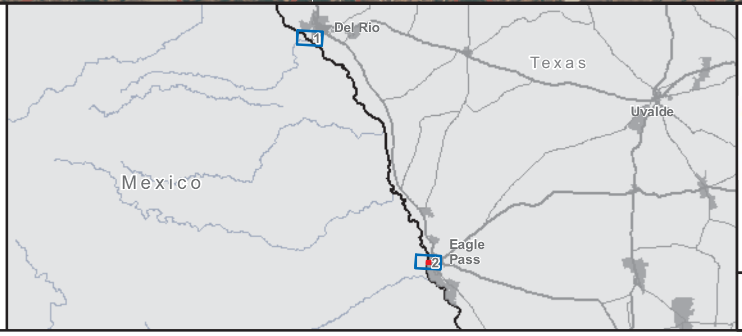
*Staging area is based on a file provided from USACE Galveston District on 31 March 2008 via e-mail and reconfirmed on 6 June 2008.



Fence Sections
Access Roads
Staging Areas
Previously Approved Fence Section - M-2B Not Part of Project
Land Parcels
Census Tracts
Historic Property
Historic District
Brush Clearing
Port of Entry
Surface Water

Feet
0 500 1,000 2,000
Scale

N



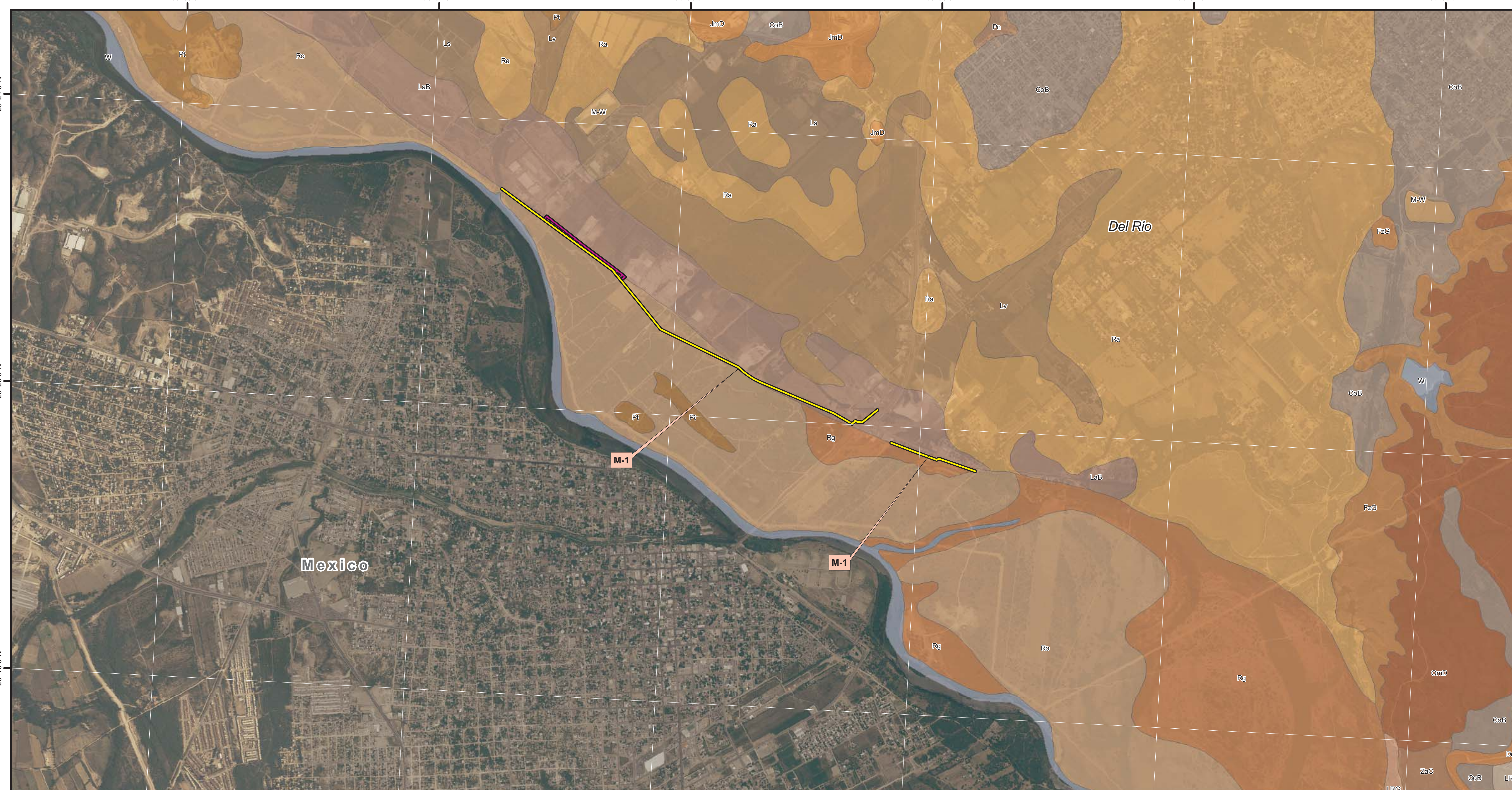
Environmental Stewardship Plan
for the Construction, Operation,
and Maintenance of
Tactical Infrastructure
U.S. Border Patrol
Del Rio Sector, Texas
Detailed Fence Section Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 20, 2008	Scale 1" = 2000'	Map 2 of 2

APPENDIX E

Detailed Maps of the Tactical Infrastructure Sections Showing Soils



Fence Sections

Access Roads

Staging Areas *

Soil Types

CoB, Coahuila clay loam, 0 to 3 percent slopes

De, Dev soils, frequently flooded

FzG, Felipe and Zorra soils, very rocky, 8 to 40 percent slopes

JmD, Jimenez-Quemado complex, 1 to 8 percent slopes

LRE, Langtry-Rock outcrop association, rolling

LRG, Langtry-Rock outcrop association, very steep

LaB, Lagloria loam, 0 to 3 percent slopes

Ls, Laredo silty clay loam

Lv, Laredo variant silty clay loam

M-W, Miscellaneous water

OmD, Olmos very gravelly loam, 1 to 8 percent slopes

Pn, Pintas clay, frequently flooded

Pt, Pits

Ra, Reynosa silty clay loam

Rg, Rio Grande silt loam, occasionally flooded

Ro, Rio Grande soils, frequently flooded

W, Water

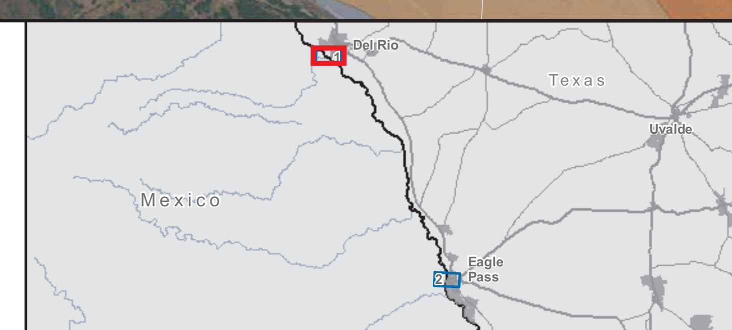
ZaC, Zapata-Vinegarroon complex, 1 to 5 percent slopes

Feet

0 500 1,000 2,000

Scale

N

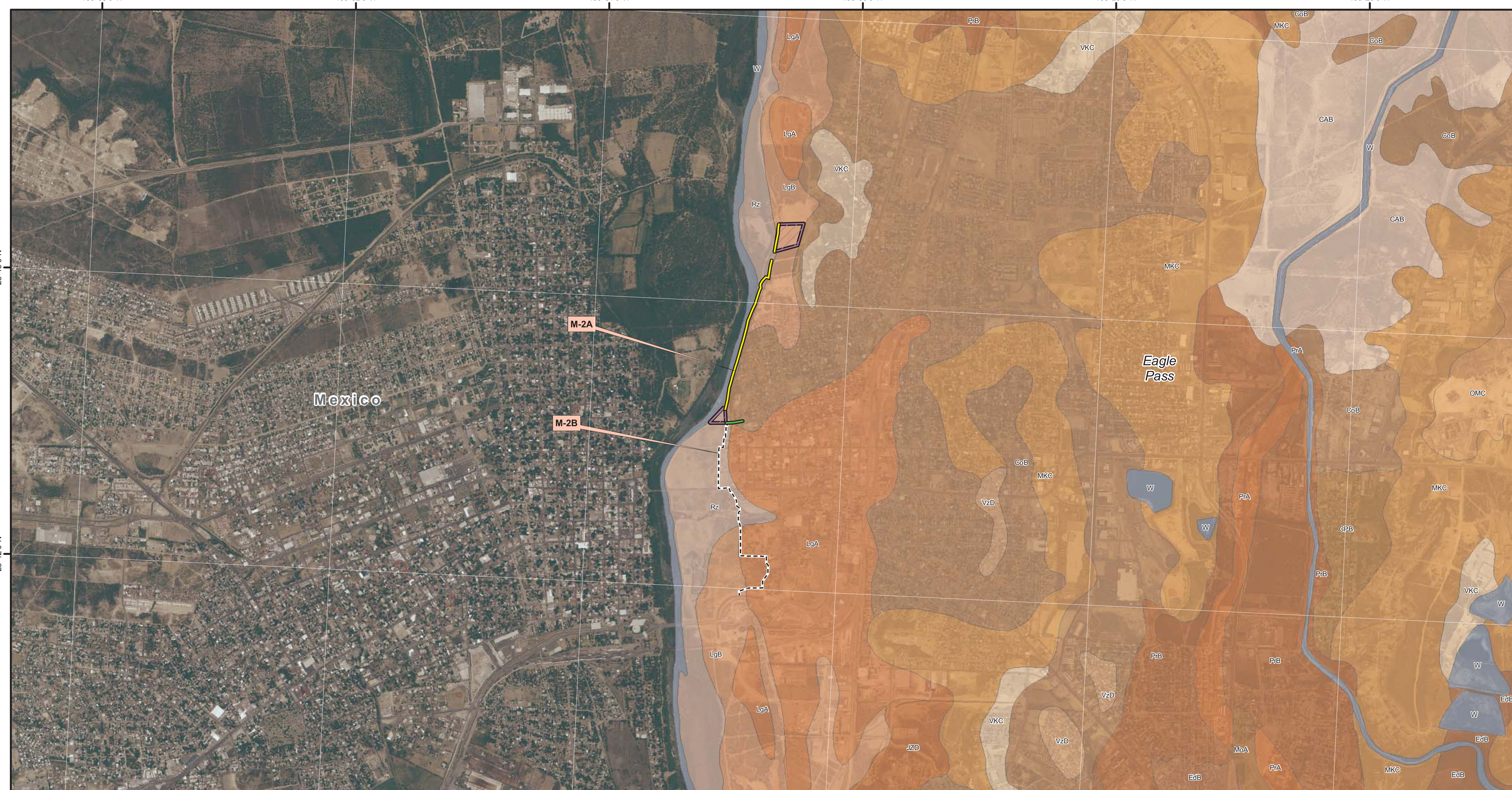


Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure U.S. Border Patrol Del Rio Sector, Texas Soil Maps Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 20, 2008	Scale 1" = 2000'	Map 1 of 2

*Staging area is based on a file provided from USACE Galveston District on 31 March 2008 via e-mail and reconfirmed on 6 June 2008.



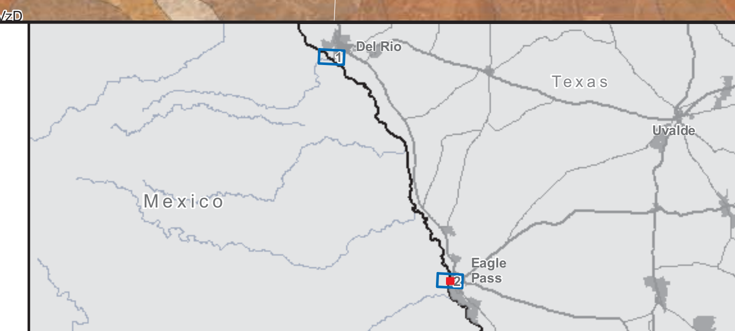
Fence Sections
Access Roads
Staging Areas
Previously Approved Fence Section - M-2B, Not Part of Project

Soil Types

- CAB, Catarina association, gently undulating
- CPB, Copita association, gently undulating
- CoB, Copita sandy clay loam, 1 to 3 percent slopes
- EdA, Elindio silty clay loam, 0 to 1 percent slopes
- EdB, Elindio silty clay loam, 1 to 3 percent slopes
- JZD, Jimenez association, rolling
- LgA, Lagloria very fine sandy loam, 0 to 1 percent slopes
- LgB, Lagloria very fine sandy loam, 1 to 3 percent slopes
- MKC, Maverick association, undulating
- MdB, Maverick clay, 1 to 3 percent slopes
- MoA, Montell clay, 0 to 1 percent slopes
- OMC, Olmos association, undulating
- PrA, Pryor clay loam, 0 to 1 percent slopes
- PrB, Pryor clay loam, 1 to 3 percent slopes
- Rz, Rio Grande and Zalla soils, frequently flooded
- VKC, Verick association, undulating
- VzD, Verick and Zapata soils, 1 to 8 percent slopes
- W, Water

Feet
0 500 1,000 2,000
Scale

N



Environmental Stewardship Plan for the Construction, Operation, and Maintenance of Tactical Infrastructure
U.S. Border Patrol
Del Rio Sector, Texas
Soil Maps
Version 1

Projection: Albers
USA Contiguous Albers Equal Area Conic
North American Datum of 1983

May 20, 2008	Scale 1" = 2000'	Map 2 of 2

APPENDIX F

Biological Survey Report

BIOLOGICAL SURVEY REPORT

FOR CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE USBP DEL RIO SECTOR, TEXAS

Prepared for

U.S. Department of Homeland Security
Customs and Border Protection
U.S. Border Patrol
Del Rio Sector, Texas

Prepared by

e2M
Solutions Today for a Sustainable Tomorrow

APRIL 2008

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
BMP	Best Management Practice
BSR	Biological Survey Report
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
CWA	Clean Water Act
e²M	engineering-environmental Management
ESP	Environmental Stewardship Plan
FE	Federally Endangered
FEMA	Federal Emergency Management Agency
FT	Federally Threatened
GIS	Geography Information Systems
GPS	Global Positioning Systems
IBWC	International Boundary and Water Commission
JV	Joint Venture
MJD	Multi-Jurisdictional Dataset
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
POE	port of entry
RGJV	Rio Grande Joint Venture
ROE	right-of-entry
SE	State Endangered
ST	State Threatened
TPWD	Texas Parks and Wildlife Department
TXNDD	Texas Natural Diversity Database
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

BIOLOGICAL SURVEY REPORT
FOR
CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE
U.S. BORDER PATROL DEL RIO SECTOR, TEXAS

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1. Introduction

This Biological Survey Report (BSR) synthesizes information collected from a variety of literature sources and field surveys to describe the biological resources within the project corridor, provides support information from the Project region, allows evaluation of the potential impacts of the Project on those biological resources within the Project Environmental Stewardship Plan (ESP), and provides the basis for recommendations for avoidance or reduction of those impacts using mitigation including best management practices (BMP). Information was gathered from publicly available literature, data provided by relevant land management agencies, review of aerial photography and U.S. Geological Survey (USGS) topographic maps, data from the State of Texas, data from NatureServe, the National Wetlands Inventory (NWI), and corridor field surveys conducted in November 2007 and January 2008. The BSR was prepared as an independent document that is an appendix to the ESP developed for this Project.

In general, the project corridor encompasses approximately 4 miles in length and approximately 139 acres. Approximately 112 acres of nonnative and native vegetation providing wildlife habitat and approximately 27 acres that support land use in the form of fallow and irrigated agriculture, urban and residential development, roads, and open water occur in the project corridor. Staging areas occur on approximately 8.3 acres in the project vicinity; 6 percent (approximately 0.5 acres) of the staging area surfaces are composed of existing roads and trails.

Herbaceous vegetation (grasslands, forblands, emergent wetlands) comprises approximately 31 percent of the project corridor or a total of approximately 34.6 acres. Shrublands (dwarf, short, and tall) compose approximately 55 percent of the project corridor or a total of 61.1 acres. Forests and woodlands compose approximately 15 percent of the project corridor or 16.4 acres total cover. Staging area vegetation (approximately 7.8 acres) is composed of 82 percent nonnative grassland and forbland, 4 percent shrubland, and 10 percent woodland and forest habitats. The vegetation represents a combination of mostly nonnative grasses that have become established in dense stands on floodplains and gravel pits, in pastures, and as forest and woodland understory; shrublands that are invading herbaceous vegetation stands or occur on gravelly upland substrates; and woodlands invading pastures and riparian woodlands and forests.

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2. Project Description

U.S. Customs and Border Protection (CBP) plans to construct, maintain, and operate tactical infrastructure consisting of primary pedestrian fence and associated access roads, patrol roads, lights, and other tools along the U.S./Mexico international border in the U.S. Border Patrol (USBP) Del Rio Sector, Texas. The locations of tactical infrastructure are based on a USBP Del Rio Sector assessment of local operational requirements where it will assist USBP agents in reducing illegal cross-border activities. Tactical infrastructure will be constructed in two sections along the international border (**Table 2-1**). The individual tactical infrastructure sections range from 0.8 to 2.3 miles in length.

Table 2-1. Tactical Infrastructure Sections, Del Rio Sector

Section Number	USBP Station	General Location	Length of Section (miles)
M-1	Del Rio	Del Rio, Texas	2.3
M-2A	Eagle Pass	Eagle Pass, Texas	0.8
		Total	**3.1**

The following discussion provides a general description of each section considered. The Project alignment was developed through coordination with Federal and state agencies to identify an alignment for the infrastructure that will meet current operational requirements with fewer environmental effects.

In Del Rio, the Project will parallel the U.S. Section of the International Boundary and Water Commission (IBWC) floodplain. The Project will be located outside the IBWC floodway but inside the Federal Emergency Management Agency (FEMA) 100-year floodplain. The Project also includes removing giant reed (*Arundo donax*) and other brush in a 150-foot-wide corridor and constructing an access and patrol road along the entire length of the primary pedestrian fence section, south of the primary pedestrian fence.

The tactical infrastructure will affect approximately a 150-foot-wide corridor along Section M-1. This corridor will include primary pedestrian fences, access roads, and patrol roads. In addition, a 150-foot-wide corridor will be maintained free of giant reed (to the extent practical) along Section M-1. This corridor will include giant reed removal from 100 feet south to 50 feet north of the primary pedestrian fence.

In Eagle Pass, Section M-2A, the Project will generally parallel the bank of the Rio Grande. Section M-2A will connect to a previously evaluated and approved primary pedestrian fence section, Section M-2B, which is addressed in an existing National Environmental Policy Act document. Approximately 0.5 miles of

Section M-2A will be a 15- to 18-foot-high concrete retaining wall and the remaining length will be aesthetic fencing. The Project also includes improving patrol roads along the entire length of the primary pedestrian fence sections and managing giant reed growth.

The tactical infrastructure will affect approximately a 60-foot-wide corridor along Section M-2A. This corridor will include a primary pedestrian fence, concrete retaining wall, improvement of the existing access and patrol roads, and lights.

3. Survey Methods and Limitations

To provide flexibility in placment of tactical infrastructure within the project corridor, and to ensure consideration of potential impacts due to construction, patrol, and maintenance, surveys were conducted in an area extending 150 feet north and 150 feet south of the alignment. The surveys also extended at least 0.5 miles past the ends of each section. The areas thus defined are referred to hereafter as the “survey corridor” or “project corridor.”

Intuitive controlled investigations of the survey corridor were conducted by employees of engineering-environmental Management, Inc. (e^2M): James Von Loh (senior ecologist), Valerie Whalon (staff biologist), Karen Stackpole (staff biologist), Shannon Cauley (wetlands ecologist), and Gena Jannsen of Jannsen Biological (a subcontractor to e²M and a U.S. Fish and Wildlife Service [USFWS]-approved botanist in Texas, specifically for Tamaulipan brushland/south Texas brush country). The November 2007 and January 2008 surveys examined the project corridor beginning on 5 November 2007 and 30 January 2008. Necessary to access properties were rights-of-entry (ROEs) approvals and CBP escort.

Due to the timeframe for acquiring field information, e²M assigned senior ecologists and biologists familiar with vegetation and wildlife habitat classification and mapping protocols, and field sampling methods to intuitively examine the landscape and project corridor for the four-mile length. Further, senior e²M natural resources staff teamed with a USFWS-approved and experienced South Texas botanist to ensure accurate identification of plant species and competent surveys for rare plants and potential habitat. The surveys were controlled, in that ROE were approved for a 150-foot corridor width, and survey crews were accompanied by USBP agents who served as guides, shared knowledge of wildlife sightings and other pertinent information, contacted landowners, if necessary, and ensured surveyor safety while in the field. Investigations included observed plant and wildlife species lists by fence section; an assessment of habitat and surveys for rare plant and wildlife species; landscape photography points; observation points recording dominant species; location, cover, and environmental conditions; photographic documentation; determination of potential wetlands for future research; and general note-taking of natural resources and other reporting needs.

Biologists walked the project corridor for each tactical infrastructure section where approved ROE was obtained. They conducted reconnaissance-level surveys on areas of land use (urban areas) and examined in detail areas containing unique species compositions or habitat that might be conducive to sensitive species (e.g., grasslands, shrublands, woodlands, forests, wetlands, water bodies). Observation data (Universal Transverse Mercator [UTM] coordinates, photographs, field notes, environmental information, vegetation structure, and plant community composition) were recorded at regular intervals along the corridor where vegetation occurred as homogenous stands and also where plant communities presented substantial shifts in species composition. These data were used to generate a vegetation classification and map to inform delineation of habitat types, analyses of potential sensitive species occurrences, and analyses of potential Project impacts on biological resources (**Attachment A**). Vegetation type and land use maps are included as a digital file in this BSR. Although no protocol surveys were conducted, botanists and wildlife biologists specifically examined habitats to determine the presence of state- and Federal-listed species (**Table 3-1**). Descriptions of the federally listed species are provided in **Attachment B**.

Table 3-1. Federal- and State-Listed Species Potentially Occurring in the Project Area

Common Name	Scientific Name	County	Federal Status	State Status
Plants				
Texas snowbells	*Styrax texana*	VV	**E**	**E**
Tobusch fishhook cactus	*Ancistrocactus tobuschii*	VV	**E**	**E**
Mussels				
Texas hornshell (clam)	*Popenaias popeii*	VV	**C**	
Fish				
Blotched gambusia	*Gambusia senilis*	VV		**T**
Blue sucker	*Cycleptus elongates*	M		**T**
Conchos pupfish	*Cyprinodon eximius*	VV		**T**
Devils River minnow	*Dionda diabolic*	VV	**T**	**T**
Fish (continued)				
Pecos pupfish	*Cyprinodon pecosensis*	VV		**T**
Proserpine shiner	*Cyprinella Proserpina*	M		**T**
Rio Grande darter	*Etheostoma graham*	M		**T**
Rio Grande silvery minnow	*Hybognathus amarus*	M	**E**	**E**
Amphibians				
South Texas siren (Large form)	*Siren sp. 1*	M		**T**
Reptiles				
Indigo snake	*Drymarchon corais*	M		**T**
Reticulate collared lizard	*Crotaphytus reticulatus*	M		**T**
Texas horned lizard	*Phrynosoma cornutum*	M		**T**
Texas tortoise	*Gopherus berlandieri*	M		**T**
Trans-Pecos black-headed snake	*Tantilla cucullata*	VV		**T**

Common Name	Scientific Name	County	Federal Status	State Status
Birds				
American peregrine falcon	*Falco peregrines anatum*	M	**DL**	**E**
Arctic peregrine falcon	*Falco peregrines tundrius*	M	**DL**	**T**
Interior least tern	*Sterna antillarum athalassos*	M, VV	**E**	**E**
Black-capped vireo	*Vireo atricapilla*	VV	**E**	**E**
Brown pelican	*Pelecanus occidentalis*	VV	**E**	
Common black hawk	*Buteogallus anthracinus*	VV		**T**
Peregrine flacon	*Falco peregrines*	M	**DL**	**ET**
Zone-tailed hawk	*Buteo albonotatus*	VV		**T**
Mammals				
Gulf Coast jaguarundi	*Herpailurus yaguarondi*	M	**E**	**E**
Gray wolf	*Canis lupus*	M	**E**	**E**
Black bear	*Ursus americanus*	M	**T/SA;NL**	**T**
White-nosed coati	*Nasus narica*	M		**T**
Ocelot	*Leopardus pardalis*	M	**E**	**E**

Sources: TPWD 2007, USFWS 2007

Notes: E = Endangered; DL = Delisted; NL = Not Listed; SA = Similar Appearance to a Threatened or Endangered Species; T = Threatened; C = Species for which USFWS has on file enough substantial information to warrant listing as threatened or endangered. M = Maverick County (Section M-2A); VV = Val Verde County (Section M-1)

Texas Department of Wildlife and Parks; Texas Natural Diversity Database

The Texas Natural Diversity Database (TXNDD) was established in 1983 and is the Texas Parks and Wildlife Department's (TPWD) most comprehensive source of information related to rare, threatened, and endangered animals, plants, exemplary natural communities, and other significant features. While these data are continually updated, there are gaps in coverage and species information due to lack of access to land for inventory, data from many sources, and a lack of staff and resources to collect and process data for all rare and significant resources. To request information from the TXNDD, please refer to <*http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species.phtml*>.

For the project corridor, TXNDD was used to assist with the evaluation of environmental impacts of the sections under consideration. The interpretation and extrapolation of the data included consideration of (1) data gaps occur because of lack of access to private land, (2) the restriction of data extraction from only public information sources, (3) species and geographic coverage focused on the most rare species and ecosystems, and (4) the lack of precise locality data in many secondary sources. Because of the small proportion of public land versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. However, it is based on the best data available to TPWD in terms of rare species locations and distributions and use of qualified biologists to provide onsite inventory and evaluation.

County lists of rare species were acquired from TPWD and these were consolidated into **Table 3-1**. The county lists include species of conservation concern in Texas. In general, species that appear on county lists do not all share the same probability of occurrence within a county, e.g., some species are migrants or wintering residents and a few species might be historic or considered extirpated within a county.

4. Environmental Setting

The project area climate is semi-arid continental (NOAA 2007) and has been further described as subtropical steppe within the modified marine climatic type, meaning that summers are long and hot and winters are short, dry, and mild (Larkin and Bomar 1983, Bailey 1995). The marine climate forms in response to the predominant onshore flow of tropical maritime air from the Gulf of Mexico. Onshore air flow is modified by a decrease in moisture content from east to west and by intermittent seasonal intrusions of continental air.

Temperatures in Del Rio occur in an average range of lows from 39 degrees Fahrenheit (°F) (January) to 74 °F (July) to an average range of highs from 62 °F (January) to 96 °F (July). The average annual precipitation is 18 inches, and approximately 80 percent occurs as showers and thunderstorms from the late spring through early fall seasons. The area experiences a long growing season of approximately 300 days. The evaporation rate during the summer season is high, and the average relative humidity is 44 percent, measured in the afternoon.

The vegetation of the Rio Grande Delta of southern Texas has generally been classified under the Dry Domain, Tropical/Subtropical Steppe Division by Bailey (1995). The project area is more finely classified as the Southwestern Plateau and Plains Dry Steppe and Shrub Province. The TPWD (TPWD 2007) provides discussion and describes vegetation geography to biotic provinces and natural regions using topographic features, climate, vegetation types, and terrestrial vertebrates. This system places the project area in the Tamaulipan Biotic Province, South Texas Brush Country (Rio Grande Basin) Natural Region, and the Level III Ecoregions of the Southern Texas Plains.

Occurring within the Lower Rio Grande Valley of southern Texas and northern Mexico, Tamaulipan Brushland represents a unique ecosystem (USFWS 1988). The characteristic natural vegetation is dense and thorny, and plant species distribution can be correlated with geologic formations. The Rio Grande floodplain supports tall and dense riparian forest, woodland, shrubland, and herbaceous vegetation, while the xeric upland areas support mostly spiny shrubs, short-stature trees, and dense nonnative grasslands. Between the 1920s and 1980s, more than 95 percent of the native brushland and 90 percent of the riparian vegetation had been converted to agriculture and urban land use (USFWS 1988). In 1988, it was estimated that 98 percent of the lush, subtropical region of the Rio Grande Delta had been cleared of native vegetation in the United States and a large but unknown percentage cleared in Mexico.

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5. Biological Resources

5.1 Vegetation Classification

The USFWS (1988) recognized 11 biotic communities in the Lower Rio Grande Valley using a combination of plant species dominance, wildlife use, topography, hydrology, and geology. Sections M-1 and M-2A lie within the Chihuahuan Thorn Forest biotic community, as described by USFWS ecologists. Chihuahuan Thorn Forest is a desert shrub community characterized by upland and riparian components, e.g., sotol, catclaw mimosa, blackbrush acacia shrublands and black willow, Montezuma baldcypress, Texas ebony, and honey mesquite riparian woodlands and forests.

NatureServe (2007) has defined ecological systems to represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes such as fire or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. The ensuing vegetation description for the project area was prepared in the framework of ecological systems that include the following:

1. Tamaulipan Floodplain Ecological System (CES301.990)
2. Tamaulipan Mesquite Upland Scrub Ecological System (CES301.984)
3. Tamaulipan Mixed Deciduous Thornscrub Ecological System (CES301.983)
4. Tamaulipan Savanna Grassland Ecological System (CES301.985)
5. North American Arid West Emergent Marsh Vegetation Alliances and Associations (CES300.729).

A brief description of each plant community observed within the sections is provided herein; they are distinguished using the NatureServe Vegetation Alliance level of classification or an approximation. To the extent possible, each community is illustrated and supported by representative ground photographs and foliar cover information for dominant species. Some vegetation patches and stands are introduced nonnative species and do not readily fit into a recognized vegetation alliance or ecological system predominantly designed for native vegetation; they are discussed at the end of this section.

5.1.1 Tamaulipan Floodplain Ecological System (CES301.990)

Sugarberry Riparian Woodland

Sugarberry riparian woodland stands have persisted as rare, narrow bands on the outer floodplain margin of the Rio Grande and the banks of its tributaries within Sections M-1 and M-2A (see **Figure 5-1**). Canopy cover for the mature sugarberry trees (10–15 meters tall) was approximately 10–20 percent. Honey mesquite trees were commonly present and often codominant in the canopy layer and provided 10–15 percent cover. In one stand a subcanopy layer of granjeno, retama, and honey mesquite, 2–5 meters tall, provided approximately 15–20 percent cover. The herbaceous layer provided low to moderate cover, up to 30 percent, and included Bermuda grass, cowpen daisy, and the vine old man's beard. Another stand that had become established around seeps and a small pond included 15 percent cover each by sugarberry and black willow trees 15–20 meters tall (see also discussions under Black Willow Woodland and Emergent Wetlands types). Giant reed and Bermuda grass were codominant at this site, each provided 15–25 percent cover.

Figure 5-1. Photographs of Representative Sugarberry Habitat

Black Willow Woodland

Small stands of black willow trees mixed with a variety of other riparian trees (typically sugarberry and Mexican sabal palms) and shrubs occurred on the eastern portion of Section M-1 where seeps and springs emerged to the ground surface and ponds occurred (see **Figure 5-2**). Small pools of standing water supported elephant ears, swamp lily, arrow-weed, and small duckweed, which are described more completely under the Emergent Wetlands type. Black willow trees to 15 meters tall provided 5–15 percent cover in the canopy layer and were codominant with sugarberry, eastern cottonwood, and Mexican sabal palm that together provided approximately 20–40 percent cover. Nonnative Chinese tallow trees occurred in one stand. The common tall shrub or graminoid was giant reed or carrizo, which contributed up to 25 percent cover in these stands.

Figure 5-2. Photographs of Representative Black Willow Habitat

Giant Reed Herbaceous Vegetation

Giant reed or Carrizo occurred in dense stands 5–10 meters tall and provided cover of 40–95 percent. Stands had become established on saturated soils of Rio Grande floodplain terraces, floodplains of tributary drainages, pond edges, and ditchbanks in Sections M-1 and M-2A (see **Figure 5-3**). Understory vegetation was typically excluded due to shading, however, scattered emergent trees occurred, including sugarberry and honey mesquite to 20 meters tall. Bermuda grass was a common associate in openings along the margins of giant reed stands, providing 2–5 percent cover, and the trees sugarberry, honey mesquite, and white mulberry, 10–20 meters tall, each provided up to 5 percent cover in sampled stands. The tall shrubs Chinaberry and huisache each provided 3 percent cover in one stand within a shallow arroyo. Giant reed was identified for removal from Section M-2A under another project because it served as an effective hiding place for illegal border-crossers; however, it will not be necessary to remove the scattered native trees and shrubs that had become established within the giant reed.

Figure 5-3. Photographs of Representative Giant Reed Habitat

5.1.2 Tamaulipan Mesquite Upland Scrub Ecological System (CES301.984)

Granjeno Woodland and Shrubland

Granjeno or spiny hackberry formed stands of moderate-stature trees to 15 meters tall or was a dominant understory component in the subcanopy or tall shrub layers, 5–10 meters tall in Sections M-1 and M-2A. In representative stands granjeno cover was 20–60 percent (see **Figure 5-4**). Associated emergent and canopy trees provided low cover, up to 12 percent, and included honey mesquite and sugarberry. Retama tall shrubs provided 2 percent cover in one stand. The herbaceous layer provided low cover, 5–15 percent where canopy openings occurred, and included Bermuda grass and switchgrass.

Figure 5-4. Photographs of Representative Granjeno Habitat

Honey Mesquite Woodland

Honey mesquite woodlands with small trees 5–15 meters tall were sampled in Sections M-1 and M-2A, where they occurred in linear strips growing from bedrock exposures at the edge of the first or second Rio Grande floodplain terrace and where they re-invaded pastures. In the canopy layer, honey mesquite cover was 25–30 percent (see **Figure 5-5**). Associated canopy tree species when present included huisache and in one stand athel tamarisk, which provided low cover of 1–15 percent. The tall and short shrub layers provided low cover, 3–20 percent, and included granjeno, Texas prickly pear, and honey mesquite saplings. The herbaceous layer contributed low to moderate cover of 7–45 percent and was dominated by Bermuda grass, buffelgrass, switchgrass, and cowpen daisy. Honey mesquite trees and tall shrubs were common invaders of former and current pastureland planted to Bermuda grass.

Figure 5-5. Photographs of Representative Honey Mesquite Woodland Habitat

5.1.3 Tamaulipan Mixed Deciduous Thornscrub Ecological System (CES301.983)

Honey Mesquite Shrubland

Honey mesquite tall shrubs were distributed throughout Sections M-1 and M-2A sections and recently had become re-established in nonnative Bermuda grass pastures (over the past 10 years). Honey mesquite 2–5 meters in height in the tall shrub layer typically provided up to 15 percent cover in shrub herbaceous stands (see **Figure 5-6**). The herbaceous layer was dominated by nonnative Bermuda grass, which provided up to 80 percent cover.

Figure 5-6. Photographs of Representative Honey Mesquite Shrub Herbaceous Vegetation Habitat

Huisache Woodland

Huisache is distributed throughout Sections M-1 and M-2A, occurring as tall shrubs in the understory of woodlands and rarely as short-stature woodlands along drainages and fencerows, where re-establishment within or around nonnative Bermuda grass pastures had occurred over several years. Huisache trees ranged up to 15 meters tall and provided up to 25 percent cover in one stand along Cienegas Creek (see **Figure 5-7**). The canopy tree honey mesquite provided 5 percent cover in the sampled stand, and the tall shrub giant reed provided moderate cover (30 percent). The herbaceous layer was dominated by nonnative Bermuda grass, which provided 15 percent cover. Sparse cover, up to 2 percent, by bushy bluestem occurred on steep banks in the Cienegas Creek stand.

Figure 5-7. Photographs of Representative Huisache Woodland Habitat

5.1.4 Tamaulipan Savanna Grassland Ecological System (CES301.985)

Retama Shrubland

Retama had invaded grassland habitat along an access road to Cienegas Creek, forming tall shrublands. Where retama had become established the tall shrub provided moderate cover, up to 35 percent within Section M-1 (see **Figure 5-8**). Texas prickly-pear cactus provided 3 percent cover in the short shrub layer of the sampled stand, and lanceleaf sumac provided sparse cover. The herbaceous layer in this type was relatively monotypic and dominated by the nonnative Bermuda grass, which provided up to 45 percent cover. The forbs cowpen daisy, stinking gourd, and common horehound provided sparse cover.


Figure 5-8. Photographs of Representative Retama Habitat

5.1.5 North-American Arid West Emergent Marsh Vegetation Alliances and Associations (CES300.729)

Emergent Wetlands

Small patches of emergent wetlands occurred within Sections M-1 and M-2A and were typically sampled as herbaceous components of larger woodland vegetation stands (see **Figure 5-9**). Emergent wetland patches occupied shallow ponds, stream banks, resaca margins, saturated soils, and seeps. Observed in particular were narrow-leaved cattail, elephant-ear, swamp lily, arrow-head, flat sedge, small duckweed, pickerelweed, and algae. In the backwaters of Cienegas Creek, the emergent wetland species water-pennywort, Indian swampweed, and water lettuce occurred.

Figure 5-9. Photographs of Representative Emergent Wetland Habitat

5.1.6 Nonnative Herbaceous Vegetation Alliances and Associations

Bermuda Grass Semi-Natural Herbaceous Vegetation

A large stand of Bermuda grass had become established in a historic pasture or corral in the vicinity of the port of entry (POE) in Section M-1 and has apparently not been grazed for more than a year (see **Figure 5-10**). The POE stand was regularly mown and resembled a large lawn. Typical stands/pastures of this nonnative rhizomatous grass in the vicinity of Del Rio and Eagle Pass had become invaded by honey mesquite, huisache, and retama tall shrubs and trees and are described above under the woodland and shrubland types. On one stand adjacent to a homestead, Bermuda grass provided 90 percent cover. Associated species that individually provided 2–5 percent cover included old man's beard vines and honey mesquite shrubs and the forbs annual sunflower, cocklebur, and spiny aster.

Figure 5-10. Photographs of Representative Bermuda Grass Habitat

Russian-thistle Semi-Natural Herbaceous Vegetation

One large area that appearred to be used as a former agricultural field occupied the terrace north of the Rio Grande in Section M-2A near Eagle Pass and predominantly supported the nonnative annual forb Russian-thistle. This floodplain second-terrace was elevated above the Rio Grande first terrace by approximately 15 meters. The fine-textured soils sealed following precipitation to create shallow ponded water, as indicated by mud cracks. Russian-thistle tumbleweeds, providing up to 45 percent cover, dominated this disturbed site (see **Figure 5-11**), along with low cover of the nonnative grasses buffelgrass (4 percent cover), switchgrass (2 percent cover), and giant reed (2 percent cover). Low cover, up to 5 percent, was provided by the native forb annual sunflower. The site had several small access roads up to 4 meters wide traversing it and was apparently under planning to be developed into single family dwellings in future years.

Figure 5-11. Photographs of Representative Russian-thistle Habitat

5.2 Plant Species Identified

A list of plant species prepared during the field surveys and including wetlands indicator status and the tactical infrastructure section in which each species was identified is provided in **Table 5-1**. The number of taxa identified during the fall surveys was 74.

Table 5-1. Plant Species Observed in Del Rio Sector Sections M-1 and M-2A

Section		Scientific Name/Common Name	Wetland Indictor Status
M-1	M-2A		
	X	*Acacia berlandieri*/Guajillo	—
X	X	*Acacia farnesiana*/Huisache	—
	X	*Acacia rigidula*/Chaparro Prieto	—
	X	*Agave americana/*Century Plant	—
X	X	*Aloysia gratissima*/Whitebrush	—
X		*Ambrosia cumanensis*/Perennial Ragweed	—
	X	*Ambrosia trifida/*Giant Ragweed	FAC
X		*Ampelopsis arborea/*Peppervine	FAC
X		*Andropogon glomeratus/*Bushy Bluestem	—
X	X	*Arundo donax*/Giant Reed, Carrizo	FAC+
X	X	*Aster spinosus (Leucosyris spinosa)/*Mexican Devil-weed	FACW-
X	X	*Baccharis neglecta/*Jara Dulce, Roosevelt Weed	FAC
X		*Bothriochloa laguroides*/Silver Bluestem	—
X		*Callirhoe involucrata/*Winecup	—
X		*Calyptocarpus vialis/*Straggler Daisy	FAC
X		*Campsis radicans/*Trumpet Creeper	FAC
X		*Capsicum annuum/*Chilipiquin	—
	X	*Castela erecta*/Amargosa, Goatbush	—
	X	*Castela texana/*Amargosa	—
X	X	*Celtis laevigata*/Palo Blanco, Texas Sugarberry	FAC
X	X	*Celtis laevigata* var. *reticulata*/Palo Blanco, Netleaf Hackberry	UPL
X	X	*Celtis pallida*/Granjeno, Spiny Hackberry	—
X		*Cissus incisa (Cissus trifoliata)/*Hierba del Buey, Ivy Treebine, Possum Grape	FACU-
X	X	*Clematis drummondii*/Barbas de Chivato, Old Man's Beard	—
X		*Colocasia esculenta/*Elephant Ears, Coco Yam	OBL
	X	*Condalia spathulata*/Costilla, Knifeleaf Condalia	—

Section		Scientific Name/Common Name	Wetland Indictor Status
M-1	M-2A		
X		*Crinum americanum*/Swamp Lily	OBL
X		*Cucurbita foetidissima*/Stinking Gourd	—
X	X	*Cynodon dactylon*/Pato de Gallo, Bermuda Grass	FACU+
X		*Cyperus tenuis/*Flat Sedge	—
X		*Datura inoxia/*Indian Apple	—
	X	*Ehretia anacua*/Anacua	—
	X	*Guaiacum angustifolium*/Guayacan, Soap-bush, Ironwood	—
X	X	*Gutierrezia sarothrae/*Broom Snakeweed	—
X	X	*Helianthus annuus*/Annual Sunflower	FAC
X		*Hydrocotyle umbellata/*Water-pennywort	OBL
X		*Hygrophila polysperma/*Indian Swampweed	OBL
	X	*Lantana camara*/Lantana	FACU
X		*Lantana urticoides/*Texas Lantana	—
X		*Lemna minuta/*Small Duckweed	OBL
X		*Leucophyllum frutescens*/Cenizo, Purple Sage	—
X		*Marrubium vulgare/*Common Horehound	FACW-
X	X	*Melia azedarach/*Paraiso, Chinaberry-tree	—
X	X	*Morus alba/*Mulberry	FACU*
X	X	*Nicotiana glauca/*Tree Tobacco	FAC
X	X	*Opuntia engelmannii*/Nopal, Texas Prickly Pear	—
X	X	*Panicum virginatum*/Switchgrass	—
X	X	*Parkinsonia aculeata*/Retama	FACW-
X	X	*Pennisetum ciliare (Cenchrus ciliaris)*/Buffelgrass	—
	X	*Phoradendron tomentosum*/Mistletoe	—
X		*Phytolacca americana*/Pokeweed	FAC-
X		*Pistia stratiotes*/Water Lettuce	OBL
X		*Platanus occidentalis*/Sycamore	FAC+
X		*Pontederia cordata*/Pickerelweed	OBL
X		*Populus deltoides*/Eastern Cottonwood	FAC

Section		Scientific Name/Common Name	Wetland Indictor Status
M-1	M-2A		
X	X	*Prosopis glandulosa*/Mesquite, Honey Mesquite	—
X		*Rhus lanceolata*/Flameleaf (Lanceleaf) Sumac	—
X		*Rivina humilis*/Coralito, Pigeonberry	—
X		*Sabal mexicana*/Palm	—
X		*Sagittaria longiloba*/Arrow-head	OBL
X	X	*Salix nigra*/Sauz, Black Willow	FACW+
X	X	*Salsola australis*/Russian-thistle	FACU
X		*Sapium sebiferum*/Chinese Tallow Tree	—
X		*Sida abutifolia*/Spreading Sida	—
X		*Solanum elaeagnifolium*/Trompillo, Silverleaf Nightshade	—
X	X	*Sorghum halepense*/Johnsongrass	FACU
X	X	*Sphaeralcea angustifolia*/Globe-mallow	—
X		*Talinum angustissimum*/Flame Flower	—
X	X	*Tamarix aphylla*/Athel Tamarisk, Saltcedar	FACW
X	X	*Typha domingensis*/Tule, Narrow-leaf Cattail	OBL
X	X	*Verbesina encelioides*/Cowpen Daisy	FAC
X		*Xanthium strumarium*/Cocklebur	FAC-
	X	*Ziziphus obtusifolia*/Clepe, Lotebush	—
61	40	Total number of species in each section	
33	18	Total number of FACW- to OBL species per section	

Note: Wetland Indicator Status (NRCS 2007): Facultative Upland (FACU) – usually occurs in non-wetlands, but occasionally found in wetlands; Facultative (FAC) – equally likely to occur in wetlands or nonwetlands; Facultative Wetland (FACW) – usually occurs in wetlands but occasionally found in nonwetlands; Obligate Wetland (OBL) – occurs almost always under natural conditions in wetlands; Upland (UPL) – Occurs in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified; (*) = tentative assignments based on limited information, (-) = less frequently found in wetlands).

5.3 Fence Section Characteristics and Description of Habitat Quality

A general description of the habitat quality as it relates to rare plant species and the landscape characteristics of each section are provided below.

5.3.1 Section M-1

County:	Val Verde
Potential Listed Plant Species:	*Sclerocactus brevihamatus* ssp. *tobuschii (*formerly *Ancistrocactus tobuschii)* Tobusch fishhook cactus (FE, SE) *Styrax platanifolius* spp. *texanus* (formerly *Styrax texana*) Texas snowbells (FE, SE)
Listed Plants Observed:	None
Suitable Listed Plant Habitat Present:	No
If so, Habitat Quality:	NA

Section M-1 consists of multiple privately owned tracts of land, many with active cattle grazing and other activities. Although generally the species assemblage remains consistent from tract to tract, varying stages of succession or regrowth are evident. Southeast of the POE is a residential street that parallels the project corridor and is bounded immediately to the south by a mesic wetland area consisting of springs, shallow pools, and ponds.

The northernmost boundary of this section begins at Cienegas Creek and traverses relatively mature mesquite-hackberry woodland. Some areas of this woodland are dense enough to create a dark understory with mostly leaf litter and very little understory vegetation. Woody tree species along this area are hackberry, sugarberry, spiny hackberry, mesquite, huisache, retama, flameleaf (or lanceleaf) sumac, and one sycamore tree. Other species encountered were lantana, common horehound, chilipiquin, pokeweed, jimson weed, pigeonberry, cocklebur, stinking gourd, cowpen daisy, Bermuda grass, and buffelgrass. With the exception of the sumac and the sycamore, this same species assemblage (in varying stages of succession or regrowth) continued southeastward to the POE. There was also one large stand of giant reed in the section.

Southeast of the POE, the project corridor crosses between a line of residences and a wetland. This wetland area consists of springs, seeps, pools, and ponds, which extend within approximately 100 feet of several homes. Woody species observed were cottonwood, black willow, mesquite, tree tobacco, Chinese tallow, Chinaberry, hackberry, sugarberry, mulberry, retama, and huisache. Herbaceous plants along the mesic zone were cattails, giant reed, water-pennywort, flatsedge, swamp lily, hygrophila, small duckweed, water lettuce, pickerelweed, arrowhead, elephant ears, and straggler daisy. The southernmost ponds or impoundments were surrounded by Bermuda grass, cattails, retama, and huisache.

There was no suitable habitat for the endangered Tobusch fishhook cactus or the endangered Texas snowbells along this section.

5.3.2 Section M-2A

County:	Maverick
Potential Listed Plant Species:	None
Listed Plants Observed:	None
Suitable Listed Plant Habitat Present:	No
If so, Habitat Quality:	NA

Section M-2A consists of mostly a dense stand of giant reed along the riverside, with a thin ridge (higher in elevation) of brush just to the east, and highly disturbed open tracts or residential areas just beyond and to the east of the ridge line. The unpaved access road used for border patrol consists of very fine, powdery soil. The dense giant reed stand contains the occasional tree tobacco, Roosevelt weed, and retama, along with abundant Bermuda grass. The ridge line consists of brushy species such as mesquite, guayacan, whitebrush, and spiny hackberry, with scattered prickly pear throughout. The highly disturbed tracts along the northern extent of this section are dominated by Russian-thistle and broom snake weed, along with areas of globe mallow, buffelgrass, and switchgrass.

5.4 Wetlands and Waters of the United States

Wetlands and waters of the United States can be confusing terms and are defined here for the convenience of document users. The U.S. Army Corps of Engineers (USACE) has jurisdiction to protect wetlands under Section 404 of the Clean Water Act using the following definition:

> *. . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 Code of Federal Regulations [CFR] 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas.*

Wetlands have three diagnostic characteristics that include (1) more than 50 percent of the dominant species present must be classified as obligate, facultative wetland, or facultative; (2) the soils must be classified as hydric; and (3) the area is either permanently or seasonally inundated (Environmental Laboratory 1987).

Waters of the United States are defined under 33 *United States Code* (U.S.C.) 1344, as follows:

a. The term “waters of the United States” means

   1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

   2. All interstate waters including interstate wetlands;

   3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:

      i. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or

      ii. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

      iii. Which are used or could be used for industrial purpose by industries in interstate commerce;

   4. All impoundments of waters otherwise defined as waters of the United States under the definition;

   5. Tributaries of waters identified in paragraphs (a)(1)-(4) of this section;

   6. The territorial seas;

   7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)-(6) of this section.

      Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (CWA) (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.

   8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the EPA.

b. The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

c. The term "adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are "adjacent wetlands."

d. The term "high tide line" means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

e. The term "ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

The term “tidal waters” means those waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects.

5.4.1 Field Evaluation Summary

Observations and initial identification of potential wetlands and waters of the United States were recorded and reported to wetlands ecologists during the November 2007 field inventory. During January 2008, wetland ecology teams sampled nine potential and known wetland sites to determine the wetlands classification and boundary, determination of jurisdictional status (jurisdictional determination form), record physical site data (wetland data observation form), and acquire on-the-ground photographs. The teams assessed wetlands and waters of the United States within a 150-foot-wide corridor for the length of the Project. Additionally, construction staging areas were assessed for wetlands and waters of the United States in conjunction with the corridor analyses. In general, wetlands of the project corridor have become established in seeps and springs, rivers and creeks, canals and ditches, ponds, and arroyos.

5.4.2 Wetlands Vegetation Summary

Wetlands delineated within the Del Rio Sector included forest, woodland, shrubland, and herbaceous types. The characteristic species for each wetlands type sampled and delineated in the field are presented below by stand physiognomy.

Forest and Woodland

- Acacia – Honey Mesquite Riparian Woodland
- Black Willow – Sugarberry/Giant Reed Riparian Woodland
- Sugarberry/Giant Reed Riparian Woodland

Shrubland

- Roosevelt Weed – Honey Mesquite/Giant Reed Shrubland

Herbaceous

- Giant Reed Herbaceous Vegetation

5.4.3 Wetlands Soil Summary

Soils supporting wetlands and waters of the United States within the Lower Rio Grande Valley included (1) Lagloria very fine sandy loam, 1 to 3 percent slopes, (2) Rio Grande soils, frequently flooded; (3) Rio Grande silt loam, occasionally flooded, and (4) Zalla, frequently flooded. The common soil textures of these Rio Grande floodplain sites are coarse silt and sandy. The matrix color of the A horizon for Del Rio Sector wetland soils was consistently a light brown hue (10YR) with the value ranging from 3 to 6 and the chroma ranging from 1 to 4. Wetland soils under long-term standing water or soils saturated by the groundwater table exhibited gleying and a few exhibited mottling. The mottles were typically a light brown hue (10YR) or less commonly a brown hue (7.5YR) with values of 4 and chromas ranging from 3 to 6.

5.5 Noxious Weeds and Invasive Nonnative Species

The State of Texas maintains a noxious weed definition, species list, and control districts under a legislative determination (TDA 2008). The legislature has determined that: (1) noxious weeds are present in this state to a degree that poses a threat to agriculture and is deleterious to the proper use of soil and other natural resources, and (2) reclamation of land from noxious weeds is a public right and duty in the interest of conservation and development of the natural resources of the state (Chapter 388, Acts 1981, Sixty-seventh Legislature). Under Chapter 388 of this act "a weed or plant is considered to be a noxious weed if declared to be a noxious weed by: (1) a law of this state, or (2) the department acting under the authority of Chapter 61 if this code or any other law of this state." This Act is administered by the Texas Department of Agriculture under Title 4, Part 1, Chapter 19, Subchapter T: Noxious and Invasive Plants.

The act and other legislation provide a list of noxious weed species present and managed within Texas (see **Table 5-4**). Additionally, TPWD has listed the water lettuce, observed in Section M-1 in this survey, as a prohibited exotic species. The Web site Texasinvasives.org, provides a list of 137 plant species considered to be nonnative invasives or noxious weeds within Texas, 9 of which occur within the project corridor and are listed in **Table 5-4**.

Table 5-4. Noxious Weed List for the Project Corridor

Common Name	Scientific Name	Fence Sections Observed
Giant Reed; Carrizo[1,2]	*Arundo donax*	M-1, M-2A
Bermuda Grass[2]	*Cynodon dactylon*	M-1, M-2A
Common Horehound[2]	*Marrubium vulgare*	M-1
China-berry Tree[2]	*Melia azedarach*	M-1, M-2A
Tree Tobacco[2]	*Nicotiana glauca*	M-1, M-2A
Buffelgrass[2]	*Pennisetum ciliare*	M-1, M-2A
Water Lettuce[1,2]	*Pistia stratioides*	M-1
Russian-thistle[2]	*Salsola tragus*	M-1, M-2A
Johnsongrass[2]	*Sorghum halepense*	M-1, M-2A
Athel Tamarisk[1,2]	*Tamarix aphylla*	M-1, M-2A
Guineagrass[2]	*Urochloa maxima*	M-1, M-2A

Source: Texasinvasives.org 2007
Notes: [1] = Noxious, [2] = Nonnative Invasive

In general, nonnative noxious and invasive plant species represent a serious management concern, and their inventory, monitoring, and control is expensive for land managers. Within the project corridor, 14 species of nonnative plants have been identified and 3 of these species (i.e., giant reed, water lettuce, athel tamarisk) are considered noxious in Texas. Nonnative species usually lower the value of wildlife habitat and compete with agricultural crops resulting in lower forage value and production. Once inventoried, methods commonly used to control nonnative species include biological, mechanical, and chemical. Controls must be ongoing to be effective in reducing, but only rarely eliminating, nonnative plant species.

5.6 Wildlife and Wildlife Habitat

5.6.1 Introduction

The landscape surrounding the Del Rio Sector is unique in that it is located at the convergence of the Rio Grande Plain, Edward's plateau, and the Trans-pecos ecoregions. The southern extent of the Del Rio sector is located at the northwestern edge of the Rio Grande Plain, also known as the southern Texas brush country, or Tamaulipan brushland. The northern portion of the Del Rio

Sector is within the southwestern edge of the Edward's Plateau and is near the eastern edge of the Trans-pecos. Though the delineated boundaries of these ecoregions are all within close proximity to the Del Rio project area, the ecological systems found within the Del Rio Sector project area are more indicative of the Rio Grande Plain than the former or latter. Eleven communities have been cross checked against the National Vegetation Classification System at the ecological system level (NatureServe 2007) where four ecological systems have been described by vegetation alliances and plant associations observed during field studies.

There is a diverse array of wildlife species due to the ecotonal habitat diversity at the landscape scale. Much of the vegetation in the Del Rio area has been cleared or altered, however, National Wildlife Refuges (NWRs), state parks and wildlife areas, properties purchased for conservation by nonprofit organizations, and some private holdings, are important links in the efforts to protect the biodiversity and related economics of the region.

5.7 Wildlife Observed

Table 5-5 below lists wildlife observed during the field surveys.

Table 5-5. Wildlife Observed During Natural Resources Surveys November 5 and 6, 2007

Common Name	Scientific Name	Species Status	M-1	M-2A
Insects				
Cloudless sulfur	*Phoebis sennae eubule*	C	X	
Monarch butterfly	*Danaus plexippus*	C	X	
Painted lady butterfly	*Vanessa cardui*	C	X	
Amphibians				
Bullfrog	*Rana catesbiena*	C	X	
Rio Grande leopard frog	*Rana berlandieri*	C	X	
Reptiles				
Indigo snake	*Drymarchon corais*	ST	X	
Birds				
Baltimore oriole	*Icterus galbula*	C	X	X
Barn swallow	*Riparia riparia*	C		X
Black-bellied whistling duck	*Dendrocygna autumnalis*	C	X	
Bufflehead	*Bucephala albeola*	C	X	

Common Name	Scientific Name	Species Status	M-1	M-2A
Couch's kingbird	*Tyrannus couchii*	C	X	X
Double-crested cormorant	*Phalacrocorax auritus*	C	X	
Gadwall	*Anas strepera*	C	X	
Great egret	*Ardea alba*	C		X
Great-tailed grackle	*Quiscalus mexicanus*	C	X	X
Inca dove	*Columbina inca*	C		X
Kingfisher	*Megaceryle* sp.	C	X	
Mallard	*Anas platyrhynchos*	C	X	
Mourning dove	*Zenaida aurtia*	C	X	
Northern cardinal	*Cardinalis cardinalis*	C	X	
Northern shoveler	*Anas clypeata*	C	X	
Red-shouldered hawk	*Buteo lineatus*	C	X	
Says phoebe	*Sayornis saya*	C		X
Scissor-tailed flycatcher	*Tyrannus forticatus*	C		X
Sparrow	*Spizella* sp.	C	X	X
Vermilion flycatcher	*Pyrocephalus rubinus*	C		X
Wild turkey	*Meleagris gallopavo*	C	X	
Mammals				
Raccoon	*Procyon lotor*	C		X

Notes:
C = Common
ST = State threatened

Table 5-6. Wildlife Habitat Types Observed in the Mapping Corridor

Wildlife Habitat Type Observed	Acreage by Section Numbers		Total Acreage of Wildlife Habitats
	M-1 Impact Corridor	M-2A Impact Corridor	
Herbaceous Vegetation			
Bermuda Grass Herbaceous Vegetation	21.903	0.228	22.131
Giant Reed Shrubland/Herbaceous Vegetation	11.9633	0.528	12.491
Russian-thistle Herbaceous Vegetation	---	0.001	0.001
Shrubland			
Honey Mesquite Woodland/Shrubland	59.793	0.263	60.056
Ratama Shrubland	1.022	---	1.022
Woodland and Forest			
Black Willow Woodland	0.203	---	0.203
Granjeno Woodland/Shrubland	3.278	---	3.278
Huisache Woodland/Shrubland	0.572	---	0.572
Sugarberry - Honey Mesquite Woodland	11.132	1.193	12.325
Open Water			
Open Water Pond/Lake	2.671	---	2.671
Land Use			
Facilities (e.g., Buildings, Driveways, Landscape)	7.880	---	7.880
Private Residences	2.963	---	2.963
Roads and Trails	11.088	2.259	13.347
Total	**134.468**	**4.471**	**138.939**

5.7.1 Wildlife and Habitat Overview

The project corridor supports diverse populations and individuals of vertebrate and invertebrate wildlife species (see **Attachment D**, and unique-to-common native and nonnative wildlife habitats, described as vegetation alliances, plant associations, and land use types (see **Section 5.1**). **Table 5-5** lists wildlife observed during the field surveys. The table can provide a general indication of species richness in each section. Along the international border, climate, geology, soils, land forms, geography, precipitation, and plant communities combine to provide excellent habitat diversity. Recent estimates concur that only a small percentage of the native landscape remains within the Del Rio Sector and its associated terraces and uplands, where it is generally distributed as discontinuous vegetation patches and stands.

Vegetation and wildlife diversity within these native habitat fragments and nonnative stands totals more than 1,200 species of plants, approximately 600 species of vertebrates (including approximately 400 bird species), and 150 species of butterflies. Within the Del Rio project corridor, the broad habitat types available to resident and migrating wildlife species include herbaceous vegetation, shrubland, woodland and forest, agriculture, water bodies, and residential and urban landscapes. Most of the available wildlife habitat has become established on Rio Grande alluvium. This section provides a brief summary of wildlife habitats observed and sampled in 2007 (see **Table 5-6**) during ESP preparation, categorized as follows:

1. Herbaceous Vegetation: This class of wildlife habitat includes annual and perennial species of grasses, forbs, and graminoids, which typically are characterized by no less than 15 percent cover by shrubs or trees. Stands of herbaceous vegetation range from less than 0.5 meters up to 10.0 meters tall and range from low to dense in terms of cover. Herbaceous wildlife habitat occurs within the entire length of the project corridor.

a. *Grasslands.* Bermuda grass stands are common along the project corridor, reaching 90 percent cover in areas. Old man's beard vines, honey mesquite shrubs, and the forbs annual sunflower, cocklebur, and spiny aster contributed between 2 percent and 5 percent cover in the Bermuda grass communities observed. Occurring as pastures for grazing livestock, grass hay fields, woodland and shrubland clearings, and on the banks of the IBWC levee, these nonnative grassland habitats typically have low floristic species diversity, provide thick mats of litter as ground cover, and occur as moderate to dense stands in terms of foliar cover. Wildlife species such as the fulvous harvest mouse, blue spiny lizard, and Rio Grande leopard frog (when wetlands or water bodies are nearby) can commonly be found in Bermuda grass grasslands. Raccoons, skunks, and coyotes are also commonly found in the dense grassland habitat. Species of dove and the northern bobwhite often forage for seeds within and raptors including the Harris' and red-tailed hawks, northern harrier, and American kestrel hunt extensively over grassland habitat. Ground nesting birds, including the eastern meadowlark and lark bunting, rely on grasslands for forage, escape cover, nesting, and brood rearing.

b. *Forblands*. One forb-dominated community was identified on the second-terrace floodplain north of the Rio Grande in Section M-2A near Eagle Pass. Russian-thistle provides up to 45 percent cover at the site, intermixed with the Russian thistle in this community are the nonnative grasses buffelgrass (4 percent cover), switchgrass (2 percent cover), and giant reed (2 percent cover). Low cover, up to 5 percent, is provided by the native forb annual sunflower. Russian-thistle is a minor component (less than 10 percent) in mule deer diets. It is an important prairie dog food and pronghorn show high preference for the summer growth in years of high precipitation. Russian-thistle seeds are eaten by at least eight species of granivorous birds, including scaled and Gambel's quail. Small mammals also consume the seeds.

c. *Emergent Wetlands.* Small patches of emergent wetlands occur within Sections M-1 and M-2A. Emergent wetland patches occupy shallow ponds, stream banks, resaca margins, saturated soils, and seeps. Observed in particular are narrow-leaved cattail, elephant-ear, swamp lily, arrow-head, flat sedge, small duckweed, pickerelweed, and algae. In the backwaters of Cienegas Creek, the emergent wetland species water-pennywort, Indian swampweed, and water lettuce occur. Emergent wetlands can be tall, from 2 meters–10 meters in height and dense, providing habitat for birds, mammals, reptiles, and many invertebrates. Avian species that use emergent wetlands for roosting, nesting and brood rearing, foraging, and as escape cover include the red-winged and Brewer's blackbirds, barn and tree swallows, common yellowthroat, and purple gallinule. Vermillion and scissor-tailed flycatchers forage over emergent wetland stands. Adjacent shallow water, when present, is used by wading birds including herons and waterfowl particularly the American coot. Emergent wetlands provide important basking habitat for Texas spiny softshell turtle and the Rio Grande cooter and important escape cover and breeding habitat for the Rio Grande leopard frog.

2. <u>Shrublands</u>: This habitat class is somewhat rare within the project corridor, occupying approximately 39 acres. The characteristic shrubs range from 2 meters–10 meters tall and include mule's fat, honey mesquite, and a variety of upland thornscrub species. Shrublands provide sparse to dense cover and are more common on the ridges and hills of the western Project terminus.

   a. *Short Shrublands.* Honey mesquite shrubs are distributed throughout Sections M-1 and M-2A sections and recently have become re-established in nonnative Bermuda grass pastures over the past 10 years. Honey mesquite 2–5 meters in height in the tall shrub layer typically provides up to 15 percent cover in shrub herbaceous stands. The herbaceous layer in these shrublands is dominated by nonnative Bermuda grass, which provides up to 80 percent cover. Laredo striped whiptail, prairie racerunner, and Texas horned lizard are common to abundant in short shrub stands using them for foraging, breeding, resting, and as escape cover. Birds that commonly forage, breed, rest, and use short shrub habitats as escape cover include ruby-crowned kinglet, pyrrhuloxia, cactus wren, species of doves, and the greater roadrunner. Raptors, including the turkey and black vultures and Chihuahuan raven commonly hunt over short shrub habitats. Cottontail rabbits and coyotes commonly use short-shrub habitats for home ranges.

b. *Tall Shrublands*. Where retama has become established, the tall shrub provides moderate cover, up to 35 percent within Section M-1. Texas prickly-pear cactus provides 3 percent cover in the short shrub layer of the sampled stand, and lanceleaf sumac provides sparse cover. The herbaceous layer in this type is relatively monotypic and dominated by the nonnative Bermuda grass, which provides up to 45 percent cover. The forbs cowpen daisy, stinking gourd, and common horehound provide sparse cover. Stands of tall shrubs occur predominantly along the margins of the Rio Grande floodplain on second or third terraces or in topographic depressions. Characterized by retama, granjeno, mule’s fat, and honey mesquite tall shrubs from 4 meters–10 meters tall, this habitat type ranges from moderate to dense in terms of foliar cover. Tall shrubs provide important perching, breeding, nesting, brood rearing, and escape cover for a variety of birds including species of doves, bobwhite quail, northern mockingbird, Couch’s kingbird, and species of flycatchers. Mammals commonly use tall shrub habitats for resting, foraging, and as part of home ranges and include javelina, bobcat, coyote, gray fox, raccoon, cottontails, and the fulvous harvest mouse.

3. <u>Woodlands and Forests</u>: Open to closed-canopy stands of trees occupy approximately 276 acres throughout the length of the project corridor. Diverse riparian forests occupy the first terrace of the Rio Grande and woodlands more commonly occur on higher river terraces, in fencerows, and as restoration plantings in old agricultural fields. Woodlands typically provide moderate canopy cover and range between 5 and 15 meters tall; dense stands of nonnative grasses, particularly buffelgrass and switchgrass almost always dominate the woodland understory. Forest stands range between 10 and 25 meters tall, provide dense canopy cover, and often have subcanopy and tall shrub layers, which enhance the wildlife habitat value.

a. *Upland.* Granjeno or spiny hackberry forms stands of moderate-stature trees to 15 meters tall or is a dominant understory component in the subcanopy or tall shrub layers, 5–10 meters tall in Sections M-1 and M-2A. In representative stands granjeno cover is 20–60 percent. Associated emergent and canopy trees provide low cover, up to 12 percent, and include honey mesquite and sugarberry. Retama tall shrubs provide 2 percent cover in one stand. The herbaceous layer provides low cover, 5–15 percent where canopy openings occur, and include Bermuda grass and switchgrass. Invaluable to wildlife; fruit for birds, raccoons, deer, and jackrabbits; leaves and branches browsed by wildlife and livestock; a variety of butterfly caterpillars feed on leaves; good honey plant; cover, nest sites.

b. *Floodplain High Terraces.* Honey mesquite woodlands with small trees 5–15 meters tall were sampled in Sections M-1 and M-2A, where they occur in linear strips growing from bedrock exposures at the edge of the first or second Rio Grande floodplain terrace and where they have re-invaded pastures. In the canopy layer, honey mesquite cover is 25–30 percent. Associated canopy tree species when present include huisache and in one stand athel tamarisk, which provides low cover of 1–15 percent. The tall and short shrub layers provide low cover, 3–20 percent, and include granjeno, Texas prickly pear, and honey mesquite saplings. The herbaceous layer contributes low to moderate cover of 7–45 percent and is dominated by Bermuda grass, buffelgrass, switchgrass, and cowpen daisy. Honey mesquite trees and tall shrubs are common invaders of former and current pastureland planted to Bermuda grass. While adult mesquite plants are not palatable and are not browsed by mammals (with the possible exception of new regrowth sprouts), they provide cover for many. In addition, many species of insects are dependent on mesquite, including the cutworm (*Melipotis* spp.), the twig girdler (*Oncideris* spp.), and Bruchid beetles (Ansley 1997).

c. *Floodplain Low Terraces*. Sugarberry riparian woodland stands have persisted as rare, narrow bands on the outer floodplain margin of the Rio Grande, the banks of its tributaries, and around seeps and small ponds within Sections M-1 and M-2A. Canopy cover for the mature sugarberry trees (10–15 meters tall) is approximately 10–20 percent. Honey mesquite trees are commonly present and often codominant in the canopy layer and provided 10–15 percent cover. Other flora identified within the sugarberry riparian woodland stands are the trees granjeno, retama, and black willow. The herbaceous layer provides up to 30 percent cover, and includes cowpen daisy, old man’s beard (vine), Bermuda grass, and giant reed. Numerous avifauna use the floodplain forest habitat for foraging, breeding, nesting, brood rearing, perching, and escape cover, including the plain chachalaca, green jay, hooded oriole, northern rough-winged swallow, golden-fronted woodpecker, northern mockingbird, blue-gray gnatcatcher, groove-billed ani, and Carolina wren. Raptors, including hawks, falcons, and vultures perch in the large riparian trees and forage in their vicinity. Mammal use is typically high in these areas. Javelinas, raccoon, cottontails, ground squirrels, skunk, coyote, and bobcat commonly utilize the lower floodplain terraces for cover, foraging and hunting. High diversity of invertebrates also occur within these floodplain forests.

d. *Wooded Wetlands.* Small stands of black willow trees mixed with a variety of other riparian trees (typically sugarberry and Mexican sabal palms) and shrubs occur on the eastern portion of Section M-1 where seeps and springs emerge to the ground surface and ponds occur. Small pools of standing water support elephant ears, swamp lily, arrow-weed, and small duckweed, which are described more completely under the Emergent Wetlands type. Black willow trees to 15 meters tall provide 5–15 percent cover in the canopy layer and are codominant with sugarberry, eastern cottonwood, and Mexican sabal palm that together provide approximately 20–40 percent cover. The common tall shrub or graminoid is giant reed or carrizo, which contributes up to 25 percent cover in these stands. Small wooded wetland stands provide dense foliar cover that provides perching, breeding/nesting/brood rearing sites, and escape cover for species of flycatchers, blackbirds, and doves, in particular and also the northern mockingbird, great kiskadee, and the rare western yellow-billed cuckoo. Mammals, including the javelina and raccoon, prefer these often moist wooded wetlands habitats.

4. <u>Open Water</u>: Though occupying a small fraction of the area within the project corridor, open-water habitats are species-rich in terms of wildlife use. Of the avian species observed during the field research for the ESP, seven species are waterfowl, wading birds, or shorebirds. Water bodies occur as flowing habitats including the Rio Grande, canals, and ditches and as still habitats including lakes and ponds. The bottom substrate is typically sand and fine sediments in the Rio Grande and fine sediments and mud in canals, ditches, and standing water bodies.

   a. *Rivers, Creeks, and Canals.* Flowing open-water habitat includes the Rio Grande, a few tributary creeks, streams, arroyos, and more commonly irrigation canals and ditches. Waterfowl species that commonly use flowing open water to rest and forage include the black-bellied whistling duck and American coot and wading birds such as white ibis, herons, and lesser yellowlegs. Fish, reptiles, and amphibians were less frequently observed in the flowing open water habitats and included the Texas cichlid, Texas spiny softshell turtle, Rio Grande chirping frog, and Rio Grande leopard frog.

   b. *Lakes and Ponds.* Lakes and ponds have formed in resacas, gravel pits, and topographic lows and provide still-water habitat in a variety of depths. The wetland and riparian vegetation surrounding the shoreline and the size of the water body can dictate the species using still open water, which include the American avocet, black-necked stilt, anhinga, pied-billed grebe, American white pelican, ringed kingfisher, great blue heron, and egrets, which feed on a variety of aquatic and wetland vertebrates and invertebrates. The

Rio Grande cooter and Rio Grande leopard frog commonly occur in the small lake and pond habitats.

c. *Land Use.* Large acreages in the project corridor are maintained on a regular basis, ranging from nearly daily maintenance in urban areas to seasonal/annual maintenance on agricultural lands. Even though subject to disturbance, these habitats are important to many species of resident and migratory wildlife for all life stages ranging from movement corridors to hiding and breeding sites to important foraging sites.

d. *Irrigated Agriculture.* Fields actively used to grow crops typically included sorghum, sugarcane, corn, and truck crops such as tomatoes and broccoli. The fields under production provide valuable hiding cover, dispersal corridors, roosts, forage, and some nesting habitat. Many individuals of a variety of wildlife species including toads, snakes, harvest mice, cotton rats, and passerine birds can be displaced to surrounding habitats or killed when crops are harvested by mechanical means, leaves are burned from sugarcane stalks, and the ground is tilled post-harvest. Open agricultural fields are commonly used for hunting by the American kestrel. Cattle egrets often occur in pastures, away from water sources, where they prey on invertebrates exposed by the hooves of cattle, or when a field is being tilled.

e. *Fallow Agriculture.* Fields under seasonal rest often contain waste grain or support annual forbs and grasses that produce quantities of seed used by foraging wildlife. Seeds present on fallow fields attracted the cottontail rabbit and species of doves, blackbirds, meadowlarks, cowbirds, European starlings, quail, ducks, and geese. Turkey vultures, ravens, and other raptor species roosted on the ground in fallow agricultural fields.

f. *Residential and Urban Development.* A myriad of habitats and food and water sources are present within residential and urban areas including landscaping, open fields, structures related to buildings and other urban infrastructure, pastures, corrals, and backyard feeding stations for domestic pets and birds. Domestic pets, particularly cats, can kill individuals of small mammals and birds within urban and adjacent rural areas. Wildlife species that use residential and urban habitats regularly include raccoons, skunks, house mice, Norwegian rats, European starlings, house sparrows and finches, mockingbirds, rock doves, mourning doves, and grackles.

g. *Highways, Roads, and Trails.* Wildlife species use established transportation corridors to move and disperse rapidly across the landscape. As a result, low to moderately high death rates can be experienced depending on adjacent habitat importance to wildlife, population levels, and design speed and safety features of transportation corridors. Wildlife that forage on carrion or are omnivorous, including the turkey vulture, black vulture, crested caracara, raccoon, and coyote, can benefit from the presence of road-killed animals. Transportation structures such as bridges can provide hiding and roosting cover for species including owls or nesting sites for swallows and rock doves.

5.8 Species Groups and Habitat Affinity

5.8.1 Mammals

The three ecoregions with the highest mammal diversity in Texas (Trans-pecos, Edward's Plateau, South Texas Plains) all converge in the general area of the Del Rio Sector. These regions demonstrate a strong positive correlation between landscape heterogeneity and mammal diversity (NSRL 1997). More than 80 species of mammals are found in the Del Rio area (see **Attachment D** for a complete mammal list of the Del Rio area).

Two federally listed mammals are documented to inhabit the counties encompassing the Del Rio Sector (NSRL 1997). The federally endangered ocelot historically occupied much of the brush-dominated habitats in the central, eastern, and southern portions of Texas. This habitat now occurs as patches and small stands within their historic range. The southernmost county encompassing the Del Rio Sector is included in the current range of the ocelot. The ocelot requires dense forest or shrubland habitats with very high canopy cover (NSRL 1997). The federally threatened white-nosed coati has also been sighted in Maverick County. White-nosed coatis occupy many different types of habitat, from tropical lowlands to dry, high-altitude forests. (Marceau 2001)

5.8.2 Birds

Approximately 400 avian species, including neotropical migratory birds, shorebirds, raptors, and waterfowl, can occur in the Del Rio area (**Attachment D**).

More than 800 species of birds spend all or part of their lives in the United States as they migrate from summer breeding grounds in the north to winter in warmer climates of the south, including Latin America (USFWS 2002). Because migratory birds depend on habitats across many political boundaries, a coordinated conservation effort has been established internationally, with the USFWS being the principal Federal authority in the United States. Large numbers of birds migrate seasonally through or overwinter in the area surrounding Del Rio, using natural, managed, and agricultural habitats for forage, roosting, and cover. The rivers and other topographic features can serve as leading lines to guide raptors and neotropical migrants during migration. Of special interest is the resident population of the federally endangered interior least tern found at Lake Amistad.

Migratory birds are also economically important, e.g., birders recreate in many areas to identify migrant species and some hunters focus on migrating waterfowl, including species of ducks and geese. Organizations such as Ducks Unlimited use donations to protect and restore wetlands and associated riparian and upland systems used by migrating waterfowl and shorebirds, primarily. Avian habitats in the Del Rio area, including wetlands and riparian resources, are a priority for conservation and management organizations and agencies, including TPWD, USFWS (partnership programs and wildlife refuges), Natural Resources Conservation Service (Wetlands Reserve and Environmental Quality Incentives [EQUIP] programs), and private and nonprofit land managers.

The primary function of lands managed under the NWR System is to provide habitat for waterfowl and shorebirds in addition to other wildlife-related benefits. Federal agencies in general are responsible to protect migratory birds under Executive Order 13186, *Responsibilities of Federal Agencies To Protect Migratory Birds*. This executive order states that migratory birds are of great ecological and economical value to the United States and to other countries. They contribute to biological diversity and bring tremendous enjoyment to those who study, watch, feed, or hunt them and the critical importance of this shared resource has been recognized through ratification of international, bilateral conventions for migratory bird conservation. A list of all migratory birds included under this executive order is available under 50 *Code of Federal Regulations* (CFR) 10.13; a focused list for species occurring in the project corridor is presented in **Attachment D**.

In general, the Del Rio area represents important and unique habitat for migrant bird species, largely a result of geography, diverse and unique plant communities, and protected lands. This region represents an important bird observation area due to the diversity of habitats and the uniqueness of the birds that occur, more than 200 avian species have been recorded from the Lake Amistad Recreational Area alone. The range of open water, wetlands, riparian, playa, grassland, shrubland, woodland and forest, and agricultural land provide habitats for migrating birds. Migrant birds breed in tundra, northern forest, grasslands, subtropical scrub forest, and all suitable habitats north of the international border. In the absence of stopover habitat, migration will be difficult to likely impossible for bird species that require places to rest, feed, and avoid predators.

The Del Rio area is a migratory crossroad for individuals and flocks of hawks, shorebirds, waterfowl and other waterbirds, hummingbirds, and songbirds. The combination of high species diversity; several rare, threatened, and endangered species; large concentrations of wintering birds; several endemic subspecies; and an important migratory pathway results in the Rio Grande Plain being an important avian region for North America.

Many state and federally listed birds are found in the ecoregions adjacent to the Del Rio sector project area. The Federally listed endangered birds found in the area are the aplomado falcon, black-capped vireo, Eskimo curlew, brown pelican, interior least tern, golden-cheeked warbler, and the whooping crane. The federally listed threatened bird is the piping plover. The birds found in the area that are listed as threatened in the State of Texas are the gray hawk, white-tailed hawk, zone-tailed hawk, common black-hawk, swallow-tailed kite, bald eagle, reddish egret, piping plover, wood stork, sooty tern, tropical parula, white-faced ibis, northern beardless-tyrannulet, and rose-throated becard.

5.8.3 Herpetiles

More than 200 species of reptiles and amphibians occur in Texas (see **Attachment D** for a more complete list of herpetile species in the Del Rio area). The counties encompassing the Del Rio Sector are home to 7 species of frogs, 5 species of toads, and 2 species of amphibians. One of these species, the South Texas siren, is listed as a threatened species in the State of Texas. Reptiles are very common in the arid landscape surrounding Del Rio. Forty-four snake species, 22 species of lizard, and 7 species of turtle are found in the Del Rio area. Of these, the indigo snake, reticulated collared lizard, Texas horned lizard and the Trans-Pecos black-headed snake are listed as threatened in the State of Texas.

5.8.4 Invertebrates

With more than 100 species of butterflies recorded within the Del Rio area, this region supports a diverse butterfly fauna (see **Attachment D** for lists of butterflies). A big attraction for nature lovers at Lake Amistad is the fall Monarch butterfly migration. Year after year, thousands of Monarchs roost in the same few trees as they head to their wintering grounds in Mexico. Other common butterflies in the area are the American snout, bordered patch, checkered white, empress Leilia, giant swallowtail, gulf fritillary, and the large orange sulphur.

5.9 Prehistoric Humans, Spanish Settlement, and Current Land Conservation

The history of the Lower Pecos River Region begins far before the U.S. Military's early camps and outposts and goes far beyond the beginning days of the Southern Pacific Railroad. The first visitors to the canyons in the Del Rio area arrived some 12,000 years ago following herds of large ice-age animals that grazed the grassy upland plateaus and ventured deep into the canyons for water. And although the people might be gone, they've left a legacy of their lifeways in the artifacts and rock art that grace the canyon walls of Amistad National Recreational Area (NPS 2008). With 250-plus known sites within a 100-square-mile area, the region has one of the densest concentrations of Archaic rock art in the new world, comparable in significance to sites in Europe, Australia, and Baja California.

At the time of first recorded European contact with the indigenous people of southern Texas, the Coahuiltecas and other hunter/gatherer Indian tribes resided in the Rio Grande floodplain and its adjacent uplands (USFWS 2001). The floodplain habitat was likely densely forested with palmetto, sabal palm, sugarberry, Texas ebony, and anaqua trees. The Rio Grande carried larger volumes of water more consistently and was subject to seasonal and periodic overbank flooding that distributed sediments and nutrients across the floodplain. The adjacent uplands were thought to be mixtures of thorn scrub and extensive grasslands or prairies.

In 1749, Spanish colonists became established in the Rio Grande Valley under the leadership of José de Escandón who founded the first settlement, Camargo. The Spanish settlers introduced domestic herd animals, e.g., cattle, horses, goats, sheep, and pigs, and they began to clear, plow, and cultivate agricultural plots and small fields within the floodplain. As a result, native humans and sensitive wildlife species, including the bear and jaguar, dispersed to other habitats or were killed by settlers. Soon afterward, the Spanish government awarded land grants for homesteading in the region of south Texas. Additional European settlers arrived in large numbers in south Texas between 1820–1870, resulting in nearly immediate changes in the landscape and associated plant communities/wildlife habitat. The suppression of fire by European settlers, combined with heavy livestock grazing contributed to the development of the current thorn woodlands common throughout southern Texas.

Today many agencies and conservation groups are working together with the common goal of restoring and preserving some of the natural systems that once dominated the landscape in the Rio Grande Plains. A good example of this effort is the Texas Wildlife Action Plan, initiated by the TPWD (TPWD 2008).

5.10 Habitat Monitoring and Management

It is important that land managers understand basic ecological principles of plant succession, plant growth, food chains, water, and mineral and soil nutritive cycles as they affect range, wildlife, and grazing management. Additionally, the basic needs and preferences of the livestock and wildlife species being managed should be well-researched and documented. It is equally important to manage for a high level of plant succession and quality wildlife habitat using the basic tools of grazing, rest, fire, hunting, animal impact, disturbance, and technology. Management using these principles results in high-quality habitat for wildlife and can result in more stable conditions during stress periods such as droughts and during the winter season.

An essential component to good management is basic information on the potential outcomes of alternative decisions. Monitoring is a way to gain information on the states and trends of varied attributes of a resource. The information collected through properly designed monitoring protocols allows the collective knowledge of scientists and land managers to be applied to the many difficult questions that are involved in habitat management.

Quality habitats are the key to sustaining wildlife populations. Habitat biologists typically monitor several components when assessing wildlife habitats, including (1) diversity of shrub or brush species, (2) browsing pressure, (3) amount of herbaceous cover, (4) water distribution, (5) stocking rates and grazing systems for livestock, (6) deer and other large mammal density, and (7) the use of supplemental forage. This information is then interpreted and used in the process of determining whether management goals are being met and can provide guidance into what changes need to be initiated, if any. Low-quality wildlife habitats generally lack good shrub or brush diversity, have sparse grass and forb cover, and the shrubs often have a hedged appearance or browse line. Healthy wildlife habitats are characterized by moderate to high plant species diversity, vegetation structural diversity (grasses and forbs, low-growing shrubs, trees), and moderate to high ground cover.

Wildlife biologists and private landowners implement habitat enhancement techniques or management tools to mimic some of the natural processes that probably occurred prior to European settlement in south Texas. Important to managing natural resources is to use a holistic approach, where several techniques are typically applied to develop and maintain healthy ecosystems. Single species typically deserve less attention, while the system in which they occur requires more attention. During the late 1940s, Aldo Leopold expressed five basic wildlife habitat management tools: axe, cow, plow, fire, and gun, that if used properly in combination will enhance or possibly restore habitats and key species indigenous to the south Texas Brush Country.

5.11 Habitat Restoration

Ecosystem management is a relatively new paradigm of thought concerning how to best approach the task of restoring and conserving natural systems at the landscape scale. At its core, it involves collaborative partnerships between varied stakeholders and interested parties. Collaborative partnerships can be an important tool in assembling stakeholders to mobilize for affecting change at the regional scale of wildlife habitat stewardship as well as increase the knowledge base for understanding the scope and variables involved in the management process.

Many such partnershops have been and are being developed by the TPWD. One such partnership acting in the Del Rio area is the Rio Grande Joint Venture (RGJV). A Joint Venture (JV) is a regional, self-directed partnership of government agencies and nongovernmental organizations as well as individuals. JVs deliver science-based conservation, and work in support of national and international bird conservation plans. JVs are directed by a Management Board made up of partner representatives. JV Partners are dedicated to the conservation of habitats within their region. There are many levels for participation, ranging from membership on the Management Board to participation with technical teams and working groups. The goal of the RGJV is to restore and preserve the important bird habitats of the Chihuahuan Desert and the Tamaulipan Brushlands (TPWD 2006).

5.12 Urban Wildlife Habitat

More than 80 percent of the Texas population resides in urban areas and the six largest cities together total more than 30 percent of the state's population. In south Texas towns and cities, the top three sounds that people prefer are natural sounds: birds singing, wind in the trees, and gently moving water. As such, there are many extrinsic values attached to "natural" landscapes in urban areas. Proximity to natural areas increases property values, employee satisfaction has been shown to be higher when natural open space is created for daily access onto corporate properties, and it has also been shown that hospital patients heal faster when there are views of natural landscapes outside their windows.

Many programs have been initiated by TPWD to provide guidance and support to Texas urban citizens who are interested in creating and preserving wildlife habitat in their own neighborhoods. Some examples of outreach programs provided are the Texas Master Naturalist Program, the Texas Wildscapes Program, and varied Wildlife Education Programs. The TPWD has also assigned wildlife biologists to work in each of the largest urban areas in Texas. The duties of urban wildlife biologists include providing opportunities for urban residents to reconnect with natural or semi-natural systems, presenting educational programs for urbanites on a variety of habitat/wildlife issues, serving as technical advisors on multi-agency conservation planning initiatives, and assisting landowners with habitat restoration or enhancement projects.

6. Rare Species Data

To ensure the most recent data were acquired for rare species analyses, e²M requested Element Occurrence Data from NatureServe Central Databases in Arlington, Virginia, through a referral from the USFWS (NatureServe and e²M 2007a). The data fields requested and geographic scope of this request were as follows:

1. Location and habitat data for endangered, threatened, and candidate species provided in list form by the USFWS and supplemented with online information from the TPWD and information from the NatureServe database.
2. The USFWS requested that all rare species occurring within 25 miles of the international border with Mexico be considered in this data search. Data were therefore requested for the South Texas counties of Brewster, Cameron, Culberson, Dimmitt, Edwards, El Paso, Hidalgo, Hudspeth, Jeff Davis, Jim Hogg, Kinney, Maverick, Pecos, Presidio, Starr, Terrell, Val Verde, Webb, Willacy, Zapata, and Zavala.
3. Data were requested to be delivered electronically in the form of Geographic Information Systems (GIS) layers depicting population polygons or point locations and Excel tables for species lists/tabular data and narratives of habitat and natural history information.

To protect sensitive data, a license agreement between NatureServe and e²M was signed in 2007. Data covered under the LA reside in a Multi-Jurisdictional Dataset (MJD), which includes all precise species location data for species that are federally listed (listed endangered, listed threatened, or candidate) or are listed under the State of Texas endangered species legislation. Additionally, the license agreement describes a 25-mile occurrence corridor north of the international border between the United States and Mexico as the licensed dataset for this Project. Data and text fields delivered by NatureServe under the license agreement included life history, threats, trends and management recommendations, classification status, confidence extent, county name, element information, U.S. Federal Information Processing Standard code, first observation date, global information, habitat types for animals, observation dates, location information, subnational information, survey information, and species status information.

The license agreement provides guidelines which stipulate external use of the data:

1. “Named” Locations: species names linked with locations cannot be displayed at a scale of less than 1:100,000 or the precise species location must be randomized within a USGS topographic quadrangle.

2. “Blind” Locations: when species names are not linked with locations specific locations can be displayed, except when the species records are flagged “sensitive” or if they can be identified easily by geographic attributes at a particular location.
3. Exceptions: the only allowable exception to the guidelines occurs when data are obtained from a source independent from NatureServe and the member programs.

7. Project Database and Interactive GIS

A Microsoft Access database was developed to serve as a centralized storage system for data collected during biological field surveys. The database data entry form closely mimics the field form utilized to record ecological information within the project corridor (**Attachment A**).

During field surveys, UTM coordinates were collected with Global Positioning Systems (GPS) receivers to locate observation points, photo-documentation points, and wetlands. The GPS data were post-processed and incorporated into feature classes for use in GIS. Additional data collected in the field were manually entered into the Microsoft Access database.

The information stored in the database was also linked to an interactive GIS. The interactive file, or published map document, can be viewed with ESRI's ArcReader. The datasets collected and included in the published map are biological survey areas, observation points, NWI wetlands, e²M delineated wetlands, plant communities, wildlife habitats, wildlife areas and refuges, land use, and aerial photography. The observation points are interactively hyperlinked with ground photographs acquired in the field.

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ATTACHMENT A

OBSERVATION POINT FORMS AND INSTRUCTIONAL MANUAL

OBSERVATION SURVEY FORM

SURVEY AND SITE INFORMATION

Point Code: TX __ __ __ Quad name: ________ BPU Code: ________ Aerial Photo #: ________

Type of Observation (Please Circle One): VEG/OBS OTHER (Specify) ________

Site Name ________

Survey Date ________ Surveyors ________ Size of Area: ________

GPS file name ________ Field UTM X__ __ __ __ __ __ m E Field UTM Y __ __ __ __ __ __ m N

☐ Coordinates from USGS Quad Map (if checked enter coordinates under GPS comments)

Datum NAD 83 Zone: ________ GPS Unit: ________ PDOP: ________ 3D Differential? Y / N

GPS Comments: Error: +/- ______m

Camera Name and Model:

Roll #	Frame #	Photographer	Direction/Comments

ENVIRONMENTAL DESCRIPTION

Elevation ________ m /f t From: GPS / Map (circle one) Slope ________ Aspect ________

Topographic Position:

Landform: Geology:

Cowardin System
____ Upland ____ Palustrine

Hydrology
___Permanently Flooded
___Semipermanently Flooded
___Unknown
___Seasonally Flooded
___Saturated
___Temporarily Flooded
___Intermittently Flooded

Environmental Comments:

Unvegetated Surface: *(please use cover scale below)*
___ Bare soil
___ Bedrock
___ Small rocks (0.2-10cm)
___ Large rocks (>10cm)
___ Sand (0.1-2mm)
___ Wood (>1cm)
___ Litter / duff
___ Other (describe) ________

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic Class	Cover scale for strata and unvegetated surfaces:
Trees and Shrubs __Evergreen __Cold-deciduous __Mixed evergreen-cold-deciduous Herbs ___Annual ___Perennial	___Broad-leaved ___Needle-leaved ___Microphyllous ___Graminoid ___Forb ___Pteridophyte ___Non-vascular ___Mixed (describe)	___Forest ___Woodland ___Shrubland ___Wooded Shrubland ___Dwarf Shrubland ___Shrub Herbaceous ___Herbaceous ___Nonvascular ___Sparsely Vegetated ___Wooded herbaceous	01 = 0 – 10% 02 = 10 – 25% 03 = 25 – 60% 04 = 60 – 100%

OBSERVATION SURVEY FORM

Provisional Community Name:______________________________ Plot Code: TX __ __ __

	Stratum Height Class	Stratum Cover Class	Dominant Species (mark Diagnostic species with *)	% Cover
T1 Emergent				
T2 Canopy				
T3 Sub-canopy				
S1 Tall shrub (> 2 m)				
S2 Short Shrub (< 2 m)				
S3 Dwarf Shrub (< 0.5 m)				
H Herbaceous				
N Non-vascular				

Height Scale for strata:

01 = < 0.5 m	06 = 10-15m
02 = 0.5-1 m	07 = 15-20m
03 = 1-2 m	08 = 20-35 m
04 = 2-5 m	09 = 35-50 m
05 = 5-10 m	10 = >50 m

Cover scale for strata and unvegetated surfaces:

01 = 0 – 10%
02 = 10 – 25%
03 = 25 – 60%
04 = 60 – 100%

Vegetation Characterization in Texas
OBSERVATION POINT MANUAL - 2007

This document is intended to assist you in collecting observation point data in Texas during the 2007 field season. Detailed, field-by-field instructions for data collection are provided.

VEGETATION DATA COLLECTION INSTRUCTIONS

LOCATING AN OBSERVATION POINT

You will locate sampling points based on homogenous or unique aerial photo signatures and by using site maps, topographic maps, handheld GPS receivers, and/or aerial photos.

- Topography (Topo) maps are useful in identifying the landscape through which you will be navigating, and in determining the elevation of a site.
- Aerial photos aid in navigating through the landscape, and are essential in determining where to sample to inform photo-interpreters (this will be explained in more detail). **Please** record the vegetation, and its condition, that you walk through and sample on the photo or accompanying digital orthophoto. Feel free to write comments regarding unique features as well.

Along the way... look around. Context is everything – you will have a much better sense of how your sample sites represent the landscape if you are always in analysis mode. Keep in mind that the goal of this field work and field work being conducted for vegetation classification is to sample **all** the different vegetation and geologic types that occur at the site.

Special Features… in the process of locating observation points you will encounter unique features or vegetative stands too small to sample, record their coordinates using the GPS receiver and note them on aerial photos and maps. These UTM coordinates may be added to the final production map as "Special Features. Locations of significant weed occurrences (highly invasive species that pose a big threat) and large areas of infestation may also be documented as they may represent a "semi-natural" vegetation type.

OBSERVATION POINT FORM INSTRUCTIONS – 2007

The primary role of Observation Point forms is to inform aerial photo interpretation; a secondary role is to help fill out plant association descriptions and provide distribution information for writing local descriptions of plant associations. They are representative of large and homogenous aerial photo signatures, unusual signatures, confusing signatures, and signatures that are slightly different due to shifts in dominant/understory species composition. The same vegetation type should be sampled where it occurs on different geology, where slope aspect leads to changes in density, and where effects due to fire, landslide, etc. have occurred.

- **IDENTIFIERS / LOCATORS SECTION**

Observation Point Code
This is a unique identifier you give each sample plot using the format "TX.XXX". **Please record the observation point code on both sides of the form in the provided field.**

Quad Name
Record the **full name** of the 7.5-minute quadrangle, such as "The Knoll".

1

Aerial Photo Number
The photo number is in the upper right hand corner of the photo in the format FLIGHTLINE-FRAME #. Record this number on the form. Locate your observation point on the Mylar overlay of the photo, and mark your location with a dot in a circle and the observation point number. *Again, please draw and comment on the photo overlay regarding the vegetation of the plot and the surroundings.*

County
This field will be completed in the office as part of processing the GPS data.

State
TX

Site Name
This is best determined from a topographic or site map. Select a nearby feature that is an obvious waypoint, such as the name of a canyon, lava flow, etc. This name does not need to be unique. If you sample a number of observation points in a small area, you can use the same site name for all of them.

Survey Date
Date the plot was sampled. Please use this format: Month - Day - Year.

Surveyors
List the last names of the field team members present.

GPS File Name - this is the name you give to the waypoint when you mark the observation point location in your GPS receiver. When logging an observation point, the file name would be "TX" and the number (e.g., TX101 for point #101). Mark the aerial photo with a dot with a circle around it and the observation point number, "TX101.

Datum
ALWAYS check datum settings on your GPS unit at the beginning of each day. It should **always** be NAD83. This information is **CRITICAL** for correctly applying your waypoints to the final vegetation map. If it is anything other than NAD83, **please, please, please** record this on the form. This step will keep your work from being wasted.

UTM Zone
This value is recorded from the GPS unit read-out.

Field UTM X, Field UTM Y
Record the UTM easting and northing you saved as a waypoint in your GPS receiver. Please double-check to make sure that the easting is six digits and the northing is seven digits. If recorded incorrectly, your plot will show up in Venezuela or the middle of Wyoming.

In mountainous or deep canyon country it is often difficult to obtain UTM coordinates from a GPS receiver (your unit has to be able to receive at least three or four satellites). If you are unable to obtain UTM coordinates in the observation point, or if the PDOP is greater than 8 (or EPE is greater than ±50m), first try to acquire a signal from a higher point outside (but still close to) the site. If that fails, you will need to estimate the UTM coordinates from the topo map, and manually enter these UTMs into the GPS unit.

Use a map which is in NAD83 if at all possible, since the project standard is the NAD83 datum. However, you may need to use USGS 7.5 minute maps, which use the NAD27 datum, note this.

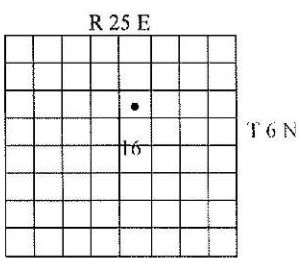
GPS Unit:
Record the name and model of the GPS receiver being used to record data for the observation point. If a GPS unit was not used to determine UTMs record 'none' here and be sure to complete the 'GPS Comments' field below.

GPS Error
Note the PDOP (or "Estimated Position Error" (EPE), if you're using a Garmin unit) displayed on your GPS unit. The lower the number, the more accurate your reading.

3D Differential?
Circle Y or N accordingly. 3D differential is obtained when your GPS unit can "see" a satellite that does nothing but correct the tiny errors in the positioning or clocks of other GPS satellites. This satellite broadcasts a real-time differential correction so that your location coordinates are as accurate as possible. It is in geosynchronous orbit in the southern sky, so if you can see the southern sky, you will generally be able to obtain 3D differential. This system is known as the Wide-Area Augmentation System, or WAAS. The Garmin and Trimble units have a field in their setup pages for turning WAAS on or off. Please make sure that WAAS is **always** on.

GPS Comments:
VERY IMPORTANT: If you resorted to estimating the observation point location UTMs on the topo map, note that in this field. If you're usual GPS croaked and you had to borrow an old Magellan from a friend, note that. Also, if you left the site to obtain a reading from a high point, record that here, along with the compass bearing and distance of the GPS location from the observation point site (unless you used the offset function on the Trimble GeoXM- in that case, enter "point offset.")

Directions to Observation Point
Give precise directions to the observation point beginning with a landmark (e.g., a named point on the topo map, a major highway, marked trailhead) readily locatable on a 7.5 minute topo map as the starting point. Use clear sentences that will be understandable to someone who is unfamiliar with the area and has only your directions to follow. Give distances and use compass directions. Be aware of the ambiguity of words like "above", "near", beyond", "on the back side of", "past". Again, using the GPS unit to give distances can be very helpful. If observation point locations lack major landmark features as guides, use township, range and sections from the topo maps. If there are no features within a reasonable distance of your site and writing directions is taking an inordinately long time, you can use a TRS description to the nearest quarter-quarter-quarter section. The TRS for the plot in the section below is "NW4SW4NE4 Sec. 16, T 6 N, R 25 E".



Photos Taken?
Circle Y or N accordingly for observation point photos.

Camera Name and Model
Circle or enter the name and model of your camera

Photos: Type/Roll Number/Frame Number/Photographer/Direction and Comments
For each photo taken at the observation point record the following: *Photo type:* indicate whether photo is a 'stand' or 'landscape' photo. *Photo number*: record photo number. *Photographer*: record last name of person taking photograph.

3

Directions/Comments: record the direction the photos were taken from and towards (eg. SE→NW) and any other comments to clarify contents of the photo (especially landscape/scenery photos).

Taking photographs
Take one representative digital photo of each observation point. The purpose is to obtain a good representation of the vegetation, not individual species. Try to include a little sky (about 10%) for perspective. Use a chalkboard to record the observation point number and the direction the photo is taken. Thus, for observation point 241, the board in the photo taken from the SE edge, facing NW, will read "SDC241, SE→NW". Take the photograph looking across the contour if site occupies a steep slope. In addition, you will need to keep a photograph log for all photos not taken on observation points.

SDC241
SE→NW

- **ENVIRONMENTAL DESCRIPTION SECTION**

Elevation
Take this measurement from the GPS receiver, in meters. Specify on the data sheet whether the measurement is in feet or meters, and whether your elevation source was the GPS unit or the topo map.

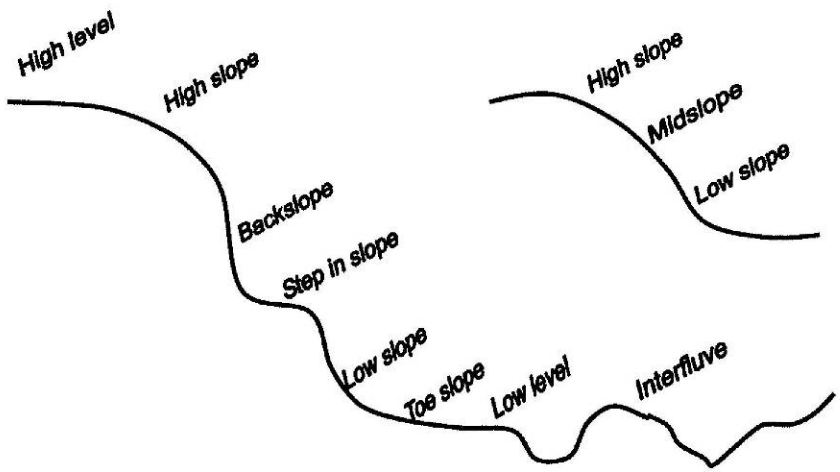
Slope
Measure the slope in degrees using a clinometer. The degree scale is the left-hand scale as you look through the clinometer. If the slope varies, estimate an average. If the observation point is on rolling microtopography, enter "variable." Describe these further under the Environmental Comments section.

Aspect
Measure the site aspect in degrees using a compass (set for local magnetic declination). If the slope is flat, enter "n/a" for aspect. If the site wraps around different aspects on a slope, enter "variable" and describe further under the Environmental Comments section.

Topographic Position
This is the position of the observation point on its related landform. Determining this requires you to think of the landform in cross-section, which is roughly diagramed below. You **must** use the terms listed below:

Interfluve (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two drainages that sheds water to the drainages.
High slope (shoulder slope, upper slope, convex creep slope). The uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.
High level (mesa, summit). Level top of a plateau.
Midslope (transportational midslope). Intermediate slope position.
Backslope (dipslope). Subset of midslopes that are steep, linear, and may include cliff segments.
Step in slope (ledge, terracette). Nearly level shelf interrupting a steep slope, rock wall, or cliff face.
Lowslope (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.
Toeslope (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, usually gentle, linear and characterized by alluvial deposition.
Low level (terrace). Valley floor or shoreline representing the former position of an alluvial plain, or lake.

TOPOGRAPHIC POSITION



Landform

Enter the landform(s) that describes the site where the plot was sampled. Referring to the topo map for the landscape context may help you decide what landform(s) to choose. Note that the landform choices may describe different scales, or that a landform feature can be described by more than one term. For example, your plot may be on a ledge on the rim of a canyon. A suggested list of landforms and definitions is provided in **APPENDIX 1.**

Note: The topographic position selected above should relate to the scale of the landform chosen here.

Surficial Geology

Note the geologic substrate where the plant community occurs. The geology map should help, but if you can't tell the geology at all or you do not have the geology map with you at the plot, put a general description (e.g., coarse sandstone, green shale, aeolian sands, or obscured by soils).

Cowardin System

The majority of the plots you'll be conducting will be "Uplands". Any wetland plots will be in the Palustrine category. This includes riparian stands. They are all fed by groundwater and support vascular plant communities.

Palustrine: All nontidal wetlands dominated by trees, shrubs, persistent emergent species, emergent mosses, or lichens. This category also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 8 ha; (2) lacking an active wave-formed or bedrock boundary; (3) water depth in the deepest part of the basin less than 2 m (6.6 ft) at low water; and (4) ocean-derived salinities less than 0.5 parts per thousand.

Hydrology

This field will mostly be completed if you are in a wetland, however, some areas considered uplands may be subject to intermittent flooding. Select from the following definitions (from Cowardin et al. 1979):

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Permanently flooded. Water covers the land surface at all times of the year in all years.
Semipermanently flooded. Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface.
Seasonally flooded. Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface.
Saturated. Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season.
Temporarily flooded. Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands.
Intermittently flooded. Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations.
Unknown. The water regime of the area is not known. The unit is labeled a non-tidal wetland.

Environmental Comments
Enter any additional noteworthy comments on the environmental setting and its effect on the vegetation. Examples include: "stunted trees due to shallow soils", "vegetation only where pockets of soil occur", or "large colluvial boulders and small rocks litter surface of soil". This field can also be used to describe site history such as fire events. This is an extremely important field for crews to document so please take the time to do a thorough job. Information from this field will be used to prepare local descriptions of the plant community and for photo interpretation.

Ground Cover
Estimate the approximate percentage of the *total* surface area covered by each category. The sum of all fields should equal 100%. A helpful hint in making ocular estimates is that in a 0.5-hectare (1.24-acre) observation point, one 7 x 7m square is equal to 1%. The sum of the cover values should equal 100%. *Notes*: Estimating lichens, dark cyanobacteria and moss also take an extra step in visualization. Also note that it is possible to have bare soil and sand in a plot if sand has blown in, or to have sand on the surface of the site. If a category is present but covers less than 1% (> 0.5%) of the ground, enter a "T" on the line next to it. If a category is present but covers a tiny bit (<0.5%) of ground, enter "t".

Animal Use Evidence
Comment on any evidence of use of the site by non-domestic animals (i.e., tracks, scat, burrows, etc.) and domestic animal use (grazing) under the Environmental Comments.

Natural and Anthropogenic Disturbance
Comment on any evidence of natural or anthropogenic disturbance and specify the source, severity and effects on the vegetation. Common disturbances on sites include gullies, colluvial deposition of rocks on slopes flash flooding and sometimes old tin cans from cowboys or miners. Notes on livestock grazing and other disturbances you may encounter in the buffer include off-road vehicle use, fire, and mass-wasting are valuable. Enter disturbance comments under the Environmental Comments

Other Comments
Record any other comments. What is the extent of the community you sampled? Describe the landscape context of the community. Describe the adjacent plant communities and their relationship to the plot. Are there any other landscape features or processes influencing this community? Is there an important species that occurs in the stand but is not within your plot? Is there a large amount of a dead plant material in the plot? Record these under the Environmental Comments field.

Unvegetated Surface

This field is an ocular estimate of ground cover. Because there is no designated sample size for areas surveyed as Observation Points, you will have to estimate percent covers for whatever size the documented area encompasses. For this estimate, you must use the cover classes listed in the bottom right hand corner of the data sheet. If an unvegetated surface category is not present in your observation point area (e.g., water is very uncommon in the sampling units), leave the corresponding line blank.

- **VEGETATION DESCRIPTION SECTION**

Leaf Phenology

Select the best description for the leaf phenology of the **dominant** stratum. The dominant stratum is the tallest stratum that contains at least 10% cover. Leave blank for non-vascular plots.

Evergreen. Greater than 75% of the total woody cover is never without green foliage. (Some tricky examples: most *Artemisia* and all *Chrysothamnus*)
Cold deciduous. Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.
Mixed evergreen - cold deciduous. Evergreen and deciduous species are mixed within the type and generally contribute 25-75% of the total woody cover.
Perennial. Herbaceous vegetation composed of more than 50% perennial species.
Annual. Herbaceous vegetation composed of more than 50% annual species.

Leaf Type

Select the best description for the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% total plot coverage. Within that dominant stratum, the species that makes up greater than 50% of cover defines the leaf type.

Broad-leaved. Woody vegetation that is primarily broad-leaved (Sagebrush, oak, California lilac).
Needle-leaved. Woody vegetation that is primarily needle-leaved (Juniper, pine, spruce, fir, hemlock).
Microphyllous. Woody cover that is primarily microphyllous (*Ephedra*).
Graminoid. Herbaceous vegetation composed of more than 50 percent graminoid species (grasses, sedges, rushes, etc).
Forb (broad-leaf-herbaceous). Herbaceous vegetation composed of more than 50% broad-leaf forb species (*Phlox, Astragalus, Lupinus, Thalictrum, Erigeron,* etc).
Pteridophyte. Herbaceous vegetation composed of more than 50 percent ferns or fern allies (scouring rushes).
Non-vascular. Dominated by lichens or mosses.
Mixed. As with leaf phenology, the dominant stratum may be composed approximately equally of species with several different leaf types. Describe the mix briefly or circle leaf types that apply.

Physiognomic Class

This represents what you see when you are standing in the plot looking across at the vegetation. The following definitions can be used as guidelines. For example, areas with scattered pines and junipers may not fit the cover classes below but they would best be described as a woodland.

Forest. Trees with their crowns overlapping (generally forming 60-100% cover).
Woodland. Open stands of trees with crowns not usually touching (generally forming 10-60% cover). Canopy tree cover may be less than 10% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.
Shrubland. Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 10% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation composed of woody vines is included this class.
Wooded Shrubland
Trees forming approximately equal cover with a shrub component.

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Dwarf-shrubland. Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 10% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively.
Shrub Herbaceous. Low or taller shrubs forming approximately equal cover with a grass or forb component. Individuals or clumps of shrubs generally not touching and usually forming more than 25% cover; trees less than 10% cover. Spaces between shrubs are generally mostly occupied by grasses and/or forbs.
Wooded Herbaceous. Trees forming approximately equal cover with a grass or forb component.
Herbaceous. Perennial herbs (graminoids or forbs) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 10% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
Nonvascular. Nonvascular cover (bryophytes, lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular perennial vegetation cover may be less than 25%, as long as it exceeds tree, shrub, dwarf-shrub, and herb cover.
Sparsely Vegetated. Abiotic substrate features dominant. Perennial vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources. Total vegetation cover is typically less than 10% and greater than 2%. Badlands, ash fields, lava beds, or sand dunes supporting communities of annual plants should be included in this category, regardless of cover.

Provisional Community Name
Record the dominant species names creating the association which most closely resembles your observation point. Devise the name based on: (1) the dominant species of the dominant strata (including nonvascular) and (2) indicate the physiognomic class (this must match the physiognomic class checked on the back side of the datasheet). For example, if you are in a P-J woodland with only scattered shrubs but a really nice galleta grass layer, you would use a provisional name like "*Pinus edulis – Juniperus osteosperma / Pleuraphis jamesii* Woodland". The provisional name is also a great help to the ecologists who will be using your work to construct a classification. Note: this field should be completed only after the entire plot is completed.

- **DOMINANT PLANT SPECIES LIST**

Species/Strata Data. The form has been developed for recording information on *species* composition and cover and *strata* cover and height. Species lists (diagnostic species) and cover estimates should be completed first; then cover class and height class estimates for strata should be recorded. Write out the complete species name. The main body of the table is dedicated to recording species names and associated cover estimates. To begin, the observer needs to make a species list for the diagnostic species in the stand and assign each species to the appropriate stratum. The next section provides a brief discussion on assigning species to the appropriate strata, followed by instructions for completing the species level information.

Stratum: Species names will be recorded within the appropriate stratum. It is important that all crew members are consistent in assignment of species to strata throughout this project. Following are some guidelines to use in determining strata. Begin by assessing the strata at your site. Trees are defined as single-stemmed woody plants, generally 5 m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions.

T1 Emergent, T2 Canopy, T3 Subcanopy. A uniform stand of pine or hemlock trees would be a good example of T2"canopy", but where trees are absent you would begin with the shrubs, or herbaceous species if no shrubs are present. If the tree crowns in your plot are mostly touching and similar in height, but a given tree species is much taller that species would be a T1"emergent." Occasionally, you will sample an area where there may be several tall, scattered pines and then shorter scattered junipers. In this case, the pines would be your "canopy" and the junipers would be the "subcanopy". You may also have pines listed in the "subcanopy" layer, if there are a number of short saplings in addition to mature tall trees.

The remaining vegetative strata are (remember to check with plant list for consistency):

S1 Tall Shrub. >2 meters tall. For example, *Sambucus racemosa, Amelanchier utahensis,*and *Cercocarpus ledifolius.*
S2 Short Shrub. <2 meters tall. For example, *Artemisia tridentata,* all *Symphoricarpos* spp.
S3 Dwarf Shrub. <0.5 meters tall. For example, *Artemisia arbuscula.*
H1 Graminoid. All grass species, including *Carex* spp. and *Juncus* spp.
H2 Forb. All forbs. (*Typha* is a forb.)
H3 Fern or Fern Ally. All ferns, including *Equisetum laevigatum.*
H4 Tree Seedlings. Seedlings are trees with vertical stems less than 1.5 m tall, but that may vary by species.
N Nonvascular. This is mainly mosses and lichens.
V Vine/liana. All vine species.
E Epiphyte. All epiphytic species.

Height can be used to define strata, but is not how species should be placed in strata. **Species characteristically belong to one stratum or another** (e.g., quaking aspen and juniper are canopy (T2), Utah serviceberry is a tall shrub (S1), antelope bitterbrush is a short shrub (S2), low sagebrush is a dwarf-shrub (S3), etc.), **EVEN when unusual environmental circumstances dictate that the plants have an unusually tall or unusually short growth form**. So even if the junipers growing in cracks are only 1.5 m tall, as long as they are mature trees, they are placed in the T2 category. About the only rule regarding height should be that the tree layer is (usually) higher than the tall shrub layer, is taller than the short shrub layer, etc.

The second point is to avoid splitting species between strata. If a few willow have been browsed to <1m tall, but most are 2m tall, they all are placed into the tall shrub stratum. There are two exceptions: (1) each height class covers more than 10% of plot, or (2) there is a reproductive layer of seedling shrubs or young trees.

The third point is how to define some of the "borderline/confusing" species. What we want to avoid is some folks calling *Apocynum* a forb and some calling it a dwarf-shrub or short shrub, for example.

Species / Percent Cover Estimates . Once you have identified your strata, list all diagnostic plant species in that strata and complete cover estimates per the following instructions.

1. **Species Name:** Refer to the plant list you have been provided for plant names used in this area. Always record the full scientific name for each species.
2. **Cover Class:** Estimate the aerial / crown cover of **each** species listed, using the cover class codes for the bottom of the page. These classes are as follows:
   01 = 0-10% 02 = 10-25% 03 = 25-60% 04 = 60-100%
3. **% Cover:** Record continuous cover value used to make cover class estimates.

Unknowns. If you can't identify or easily key out the plant at the site, assign a name to it to be recorded on your data sheet. For example, if you know what family it is in or its genus, label it "unknown Asteraceae sp." or "Unk. *Erigeron* sp.". If there is more than one unknown in a family, add a number to the name you give them. If you do not know the family, label the plant "Unknown 1", using consecutive numbers for additional unknowns. Record the cover class and other data for the unknown as you would for any other species. Then, take a sample of the species with as much of the plant as possible, especially intact sexual parts, if present. Place the sample in a plastic baggie, and either label the plant (if you are putting more than one plant in the baggie) or label the baggie with the plot code, the date and the name you gave it on the data form. Plant samples in baggies can be stored in coolers or refrigerators for short periods. If you are not able to key the plant out soon after collecting it, or you intend to keep the sample for the park collection, press the plant and with a label stating the plot or location of its collection (include UTMs if the sample is not from a plot), date, collectors name and name you assigned the plant. Also, thoroughly label any plant specimens collected as proof of plant occurrence for plants not listed on the site plant list.

Strata / Height Class, Cover Class and Diagnostic Species. Once the species list and associated cover data have been completed, the observer should then complete the following fields as specified below.

1. Indicate the average height class of the stratum in the first column, using the Height Scale at the bottom of the form. The height scale for this project is as follows:
2.

01 = <0.5 m	03 = 1- 2 m	05 = 5 – 10 m	07 = 15-20 m	09 = 35 – 50 m
02 = 0.5 – 1 m	04 = 2-5 m	06 = 10-15 m	08 = 20-35 m	10 = > 50 m

3. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale at the bottom of the form (same cover scale as for species above).
4. '*' – This Column is used to indicate which species in the strata are particularly abundant.

Record information on ***dominant species only***. There is one column that corresponds to the "Stratum" column in this table:

1. **Height.** Use the number code that best describes the heights of all plant species within a given stratum. The number codes are listed in the bottom left-hand corner of the data sheet.
2. **Cover Class.** For this ocular estimation you are looking at the aerial cover of **all** plants within a given stratum. Use the cover class codes listed in the bottom right hand corner of the data sheet and presented below.

Cover Classes	
01	0 – 10%
02	10 – 25%
03	25 - 60%
04	60 – 100%

3. **Dominant Species (Mark species that characterize the stand with a *).** List the plant species using the full scientific name. You may find that there are not enough lines, in which case you can write in the blank area under the stratum name and number codes.
4. **% Cover.** Estimate the percent aerial cover (T-100%) for each diagnostic plant species.

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APPENDIX 1: Landform Glossary
(http://soils.usda.gov/technical/handbook/contents/part629glossary1.html)

alluvial cone - A semi-conical type of alluvial fan with very steep slopes; it is higher, narrower, and steeper (e.g., > 40% slopes) than a fan, and composed of coarser, and thicker layers of material deposited by a combination of alluvial episodes and to a much lesser degree, landslides (e.g., debris flow). Compare - alluvial fan, talus cone.

alluvial fan - A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream (best expressed in semiarid regions) at the place where it issues from a narrow mountain or upland valley; or where a tributary stream is near or at its junction with the main stream. It is steepest near its apex which points upstream and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

alluvial flat (a) (colloquial: western US) A nearly level, graded, alluvial surface in bolsons and semi-bolsons which commonly does not manifest traceable channels, terraces or floodplain levels. Compare - flood-plain step, terrace, valley flat. (b) (**not preferred**) A general term for a small flood plain bordering a river, on which alluvium is deposited during floods.

alluvial plain - (a) A large assemblage of fluvial landforms (braided streams, terraces, etc.,) that form low gradient, regional ramps along the flanks of mountains and extend great distances from their sources (e.g., High Plains of North America. SW (b) (not recommended, use flood plain.) An general, informal term for a broad flood plain or a low-gradient delta. Compare - alluvial flat.

alluvial plain remnant - An erosional remnant of an alluvial plain which retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to a present-day stream or drainage network. Compare - alluvial plain, erosional remnant, paleoterrace.

alluvial terrace - (not preferred) refer to stream terrace.

alluvium - Unconsolidated, clastic material subaerially deposited by running water, including gravel, sand, silt, clay, and various mixtures of these. Compare - colluvium, slope alluvium.

anticline - (a) A unit of folded strata that is convex upward and whose core contains the stratigraphically oldest rocks, and occurs at the earth's surface. In a single anticline, beds forming the opposing limbs of the fold dip away from its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally convex upward whose core contains the stratigraphically older rocks.

arroyo - (colloquial: southwest A.) The channel of a flat-floored, ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material; sometimes called a wash. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed. Where arroyos intersect zones of ground-water discharge, they are more properly classed as intermittent stream channels.

artificial levee - An artificial embankment constructed along the bank of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.

backslope - The hillslope profile position that forms the steepest and generally linear, middle portion of the slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below. They may or may not include cliff segments (i.e. free faces). Backslopes are commonly erosional forms produced by mass movement, colluvial action, and running water. Compare - summit, shoulder, footslope, toeslope.

backswamp - A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces. Compare - valley flat.

badlands - A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such as gypsum or halite.

bajada - (colloquial: southwestern US.) A broad, gently inclined, alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins. Synonym - coalescent fan piedmont. Compare - colluvial apron.

ballena - (colloquial: western US.) A fan remnant having a distinctively-rounded surface of fan alluvium. The ballena's broadly-rounded shoulders meet from either side to form a narrow summit and merge smoothly with concave sideslopes and then concave, short pediments which form smoothly-rounded drainageways between adjacent ballenas. A partial ballena is a fan remnant large enough to retain some relict fan surface on a remnant summit. Compare - fan remnant.

ballon - (colloquial: western US). A rounded, dome-shaped hill, formed by erosion or uplift.

bar - A general term for a ridge-like accumulation of sand, gravel, or other alluvial material formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition; e.g. a channel bar or a meander bar. A generic term for any of various elongate offshore ridges, banks, or mounds of sand, gravel, or other unconsolidated material submerged at least at high tide, and built up by the action of waves or currents, especially at the mouth of a river or estuary, or at a slight distance offshore from the beach.

barchan dune - A crescent-shaped dune with tips extending leeward (downwind), making this side concave and the windward (upwind) side convex. Barchan dunes tend to be arranged in chains extending in the dominant wind direction. Compare - parabolic dune.

base slope - A geomorphic component of hills consisting of the concave to linear slope (perpendicular to the contour) which, regardless of the lateral shape is an area that forms an apron or wedge at the bottom of a hillside dominated by colluvial and slope wash processes and sediments (e.g., colluvium and slope alluvium). Distal base slope sediments commonly grade to, or interfinger with, alluvial fills, or gradually thin to form pedisediment over residuum. Compare - head slope, side slope, nose slope, interfluve, free face.

basin - (a) Drainage basin; (b) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated. (c) (colloquial: western US) A general term for the nearly level to gently sloping, bottom surface of an intermontane basin (bolson). Landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding. Where through-drainage systems are well developed, flood plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountainward to distal parts of piedmont slopes.

basin floor - A general term for the nearly level, lower-most part of intermontane basins (i.e. bolsons, semi-bolsons). The floor includes all of the alluvial, eolian, and erosional landforms below the piedmont slope. Compare - basin, piedmont slope.

basin-floor remnant - (colloquial: western US) A flat erosional remnant of any former landform of a basin floor that has been dissected following the incision of an axial stream.

bench - (not preferred) refer to structural bench.

beveled base - The lower portion of a canyon wall or escarpment marked by a sharp reduction in slope gradient from the precipitous cliff above, and characteristically composed of thinly mantled colluvium (e.g. < 1 m) and / or carapaced with a thin surficial mantle of large rock fragments from above, which overly residuum of less resistant rock (e.g., shale) whose thin strata intermittently outcrop at the surface; a zone of erosion and transport common in the canyonlands of the semi-arid, southwestern US. Compare - talus slope.

blowout - A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand, loose soil, or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Commonly small, some blowouts may be large (kilometers in diameter). Compare - deflation basin.

bluff - (a) A high bank or bold headland, with a broad, precipitous, sometimes rounded cliff face overlooking a plain or body of water, especially on the outside of a stream meander; ex. a river bluff. (b) (not preferred) use cliff. Any cliff with a steep, broad face.

bolson - (colloquial: western US.) A landscape term for an internally drained (closed) intermontane basin into which drainages from surrounding mountains converge inward toward a central depression. Bolsons are often tectonically depressed areas and, according to Peterson, include alluvial flat, alluvial plain, beach plain, barrier beach, lake plain, sand sheets, dunes, and playa. The piedmont slope includes slopes of erosional origin adjoining the mountain front (pediments) and complex construction surfaces (fans). A semi-bolson is an externally drained (open) bolson. Synonym - intermontane basin.

borrow pit - An excavated area from which earthy material has been removed typically for construction purposes offsite; also called barrow pit.

bottomland - (not recommended) use flood plain. An obsolete, informal term loosely applied to varying portions of a flood plain.

box canyon - a) A narrow gorge or canyon containing an intermittent stream following a zigzag course, characterized by high, steep rock walls and typically closed upstream by a similar wall, giving the impression, as viewed from its bottom, of being surrounded or "boxed in" by almost vertical walls. b) A steep-walled canyon heading against a cliff a dead-end canyon.

braided stream - A channel or stream with multiple channels that interweave as a result of repeated bifurcation and convergence of flow around inter-channel bars, resembling (in plan view) the strands of a complex braid. Braiding is generally confined to broad, shallow streams of low sinuosity, high bedload, non-cohesive bank material, and a steep gradient. At bank-full discharge, braided streams have steeper slopes and shallower, broader, and less stable channel cross sections than meandering streams. Compare - meandering channel, flood-plain landforms.

break - (slopes) An abrupt change or inflection in a slope or profile. Compare - knickpoint, shoulder, escarpment. (geomorphology) A marked variation of topography, or a tract of land distinct from adjacent land, or an irregular or rough piece of ground. Compare - breaks.

breaks - (colloquial: western US) A landscape or large tract of steep, rough or broken land dissected by ravines and gullies and marks a sudden change in topography as from an elevated plain to lower hilly terrain, or a line of irregular cliffs at the edge of a mesa or a river (e.g., the Missouri River breaks).

butte - An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments, commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks. Compare - mesa, plateau, cuesta.

caldera - A large, more or less circular depression, formed by explosion and/or collapse, which surrounds a volcanic vent or vents, and whose diameter is many times greater than that of the included vent, or vents. Compare - crater.

canyon - A long, deep, narrow, very steep-sided valley cut primarily in bedrock with high and precipitous walls in an area of high local relief (e.g., mountain or high plateau terrain), often with a perennial stream at the bottom; similar to but larger than a gorge. Compare - gorge, box canyon, slot canyon.

canyon bench - One of a series of relatively narrow, flat landforms occurring along a canyon wall and caused by differential erosion of alternating strong and weak horizontal strata; a type of structural bench.

canyonlands - A deeply and extensively dissected landscape composed predominantly of relatively narrow, steep-walled valleys with small flood plains or valley floors; commonly with considerable outcrops of hard bedrock on steep slopes, ledges, or cliffs, and with broader summits or interfluves than found in badlands. Sideslopes exhibit extensive erosion, active back-wearing, and relatively sparse vegetation.

channel - (a) The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water. (b) (colloquial: western US.) The bed of a single or braided watercourse that commonly is barren of vegetation and is formed of modern alluvium. Channels may be enclosed by banks or splayed across and slightly mounded above a fan surface and include bars and mounds of cobbles and stones. (c) Small, trough-like, arcuate or sinuous channels separated by small bars or ridges, caused by fluvial processes; common to flood plains and young alluvial terraces; a constituent part of *bar and channel* topography.

cinder cone - A conical hill formed by the accumulation of cinders and other pyroclastics, normally basaltic or andesitic composition. Slopes generally exceed 20 percent.

cliff - Any high, very steep to perpendicular or overhanging face of rock or earth; a precipice. Compare - bluff.

climbing dune - A dune formed by the piling-up of sand by wind against a cliff or mountain slope; very common in arid regions with substantial local relief and strong winds. Compare - sand ramp.

closed depression - A generic name for an enclosed area that has no surface drainage outlet and from which water escapes only by evaporation or subsurface drainage; an area of low ground indicated on a topographic map by a hachured contour line forming a closed loop. Compare - open basin.

collapse sinkhole - A type of sinkhole that is formed by collapse of a cave within the underlying soluble bedrock (e.g., limestone, gypsum, salt). Compare - solution sinkhole.

colluvium - Unconsolidated, unsorted material being transported or deposited on sideslopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, unconcentrated runoff. Compare - alluvium, slope alluvium, scree, talus, mass movement.

complex landslide - A category of mass movement processes, associated sediments (complex landslide deposit) or resultant landforms characterized by a composite of several mass movement processes none of which dominates or leaves a prevailing landform. Numerous types of complex landslides can be specified by naming the constituent processes evident (e.g. a complex earth spread - earth flow landslide). Compare - fall, topple, slide, lateral spread, flow, landslide.

crest - (a) The commonly linear, narrow top of a ridge, hill, or mountain. It is appropriately applied to elevated areas where retreating backslopes are converging such that these high areas are almost exclusively composed of convex shoulders; (b) (not preferred) Sometimes used as an alternative for the hillslope component *summit*. Compare - summit (*part b*), saddle.

cuesta - An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip (commonly less than 15 percent); produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope), that roughly parallels the inclined beds, and on the other side has a relatively short and steep or cliff-like slope (scarp) that cuts through the tilted rocks. Compare - hogback, mesa, dipslope, scarp slope, cuesta valley.

cuesta valley - A low relief, low angle, asymmetrical depression which lies parallel to the strike of underlying strata; a type of strike valley. It's formed by the differential erosion of weaker strata interbedded with more resistant bedrock. It may or may not contain a local drainage network and commonly lies above and is not connected to the regional drainage system. Compare - cuesta, valley, trough, hanging valley.

debris fall - The process, associated sediments (debris fall deposit) or resultant landform characterized by a rapid type of *fall* involving the relatively free, downslope movement or collapse of detached, unconsolidated material which falls freely through the air (lacks an underlying slip face); sediments have substantial proportions of both fine earth and coarse fragments; common along undercut stream banks. Compare - rock fall, soil fall, landslide.

debris flow - The process, associated sediments (debris flow deposit) or landform resulting from a very rapid type of *flow* dominated by a sudden downslope movement of a mass of rock, soil, and mud (more than 50% of the particles are > 2mm), and whether saturated or comparatively dry, behaves much as a viscous fluid when moving. Compare - lahar, mudflow, landslide.

deflation basin - A topographic basin excavated and maintained by wind erosion which removes unconsolidated material and commonly leaves a rim of resistant material surrounding the depression. Unlike a blowout, a deflation basin does not include adjacent deposits derived from the basin. Compare - blowout.

depression - Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g. a sinkhole). An open depression has a natural outlet for surface drainage. Compare - closed depression, open depression.

desert pavement - A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments, mantling a desert surface. It is formed where wind action and sheetwash have removed all smaller particles or where coarse fragments have migrated upward through sediments to the surface. It usually protects the underlying, finer-grained material from further deflation. The coarse fragments commonly are cemented by mineral matter. Compare - erosion pavement, stone line.

dike - A tabular igneous intrusion that cuts across the bedding or foliation of the country rock. Compare – sill.

dip - A geomorphic component (characteristic piece) of flat plains (e.g., lake plain, low coastal plain, low-relief till plain) consisting of a shallow and typically closed depression that tends to be an area of focused groundwater recharge but not a permanent water body and that lies slightly lower and is wetter than the adjacent talf, and favors the accumulation of fine sediments and organic materials.

ditch - An open and usually unpaved (unlined), channel or trench excavated to convey water for drainage (removal) or irrigation (addition) to or from a landscape; smaller than a canal; some ditches are modified natural waterways.

divide - (a) The line of separation; (b) The summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction. Compare – interfluve.

dome - (a) An uplift or anticlinal structure, either circular or elliptical in outline, in which the rocks dip gently away in all directions. A dome may be small (e.g. a salt dome) or many kilometers in diameter. (b) A smoothly rounded landform of rock mass such as a rock-capped mountain summit, that roughly resembles the dome of a building. (e.g. the rounded granite peaks of Yosemite, CA).

drainageway - (a) A general term for a course or channel along which water moves in draining an area. (b) a term restricted to relatively small, roughly linear or arcuate depressions that move concentrated water at some time, and either lack a defined channel (e.g. head slope, swale) or have a small, defined channel (e.g. low order streams).

draw - A small, natural watercourse cut in unconsolidated materials, generally more open with a broader floor and more gently sloping sides than an arroyo, ravine or gulch, and whose present stream channel may appear inadequate to have cut the drainageway that it occupies.

dune - A low mound, ridge, bank or hill of loose, windblown, subaerially deposited granular material (generally sand), either barren and capable of movement from place to place, or covered and stabilized with vegetation, but retaining its characteristic shape. (See barchan dune, parabolic dune, parna dune, shrub-coppice dune, seif dune, transverse dune).

dune field - An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of steams by the sand. See dune lake.

earthflow - The process, associated sediments (earthflow deposit) or resultant landforms characterized by slow to rapid types of flow dominated by downslope movement of soil, rock, and mud (more than 50% of the particles are < 2 mm), and whether saturated or comparatively dry, behaves as a viscous fluid when moving. Compare - debris flow (coarser, less fluid), mudflow (finer, more fluid).

eolian deposit - Sand, silt or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess. Conventionally, primary volcanic deposits (e.g. tephra) are handled separately. Compare - loess, parna, beach sands.

eolian sands - Sand-sized, clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sand sheet. Compare - beach sands.

ephemeral stream - Generally a small stream, or upper reach of a stream, that flows only in direct response to precipitation. It receives no protracted water supply from melting snow or other sources and its channel is above the water table at all times. Compare - arroyo, intermittent stream, perennial stream.

eroded fan remnant - All, or a portion of an alluvial fan that is much more extensively eroded and dissected than a fan remnant; sometimes called an *erosional fan remnant*. It consists primarily of a) eroded and highly dissected sides (*eroded fan-remnant sideslopes*) dominated by hillslope positions (shoulder, backslope, etc.), and b) to a lesser extent an intact, relatively planar, relict alluvial fan "summit" area best described as a tread.

eroded fan-remnant sideslope - A rough or broken margin of an *eroded fan remnant* highly dissected by ravines and gullies that can be just a fringe or make up a large part of an eroded alluvial fan; its bounding escarpments (risers), originally formed by inset channels, have become highly dissected and irregular such that terrace components (tread and riser) have been consumed or modified and replaced by hillslope positions and components (shoulder, backslope, footslope, etc.); sometimes referred to as *fan remnant sideslopes*. Compare - eroded fan remnant.

escarpment - A continuous, steep slope or cliff produced by erosion or faulting and that topographically interrupts or breaks the general continuity of more gently sloping land surfaces . The term is most commonly applied to cliffs produced by differential erosion. Synonym = scarp.

falling dune - An accumulation of sand that is formed as sand is blown off a mesa top or over a cliff face or steep slope, forming a solid wall, sloping at the angle of repose of dry sand, or a fan extending downward from a re-entrant in the mesa wall. Compare - climbing dune, sand ramp.

fan - (a) A gently sloping, fan-shaped mass of detritus forming a section of a low-angle cone commonly at a place where there is a notable decrease in gradient; specifically an alluvial fan (not preferred – use alluvial fan). Compare - alluvial fan, alluvial cone. (b) A fan-shaped mass of congealed lava that formed on a steep slope by the continually changing direction of flow.

fan apron - A sheet-like mantle of relatively young alluvium and soils covering part of an older fan piedmont (and occasionally alluvial fan) surface, commonly thicker and further down slope (e.g., mid-fan or mid-fan piedmont) than a fan collar. It somewhere buries an older soil that can be traced to the edge of the fan apron where the older soil emerges as the land surface, or relict soil. No buried soils should occur within a fan-apron mantle itself. Compare - fan collar.

fan collar - A landform comprised of a thin, short, relatively young mantle of alluvium along the very upper margin (near the proximal end or apex) of a major alluvial fan. The young mantle somewhere buries an older soil that can be traced to the edge of the collar where the older soil emerges at the land surface as a relict soil. Compare - fan apron.

fan remnant - A general term for landforms that are the remaining parts of older fan-landforms, such as alluvial fans, fan aprons, inset fans, and fan skirts, that either have been dissected (erosional fan-remnants) or partially buried (nonburied fan-remnants). An erosional fan remnant must have a relatively flat summit that is a relict fan-surface. A nonburied fan-remnant is a relict surface in its entirety. Compare - eroded fan remnant, ballena.

fan skirt - The zone of smooth, laterally-coalescing, small alluvial fans that issue from gullies cut into the fan piedmont of a basin or that are coalescing extensions of the inset fans of the fan piedmont, and that merge with the basin floor at their toeslopes. These are generally younger fans which onlap older fan surfaces.

fault-line scarp - (a) A steep slope or cliff formed by differential erosion along a fault line, as by the more rapid erosion of soft rock on the side of a fault as compared to that of more resistant rock on the other side; e.g. the east face of the Sierra Nevada in California. (b) (not recommended) A fault scarp that has been modified by erosion. This usage is not recommended because the scarp is usually not located on the fault line.

fen - Waterlogged, spongy ground containing alkaline decaying vegetation, characterized by reeds, that develops into peat. It sometimes occurs in sinkholes of karst regions. Compare - bog, marsh, swamp.

finger ridge - One in a group of small, tertiary spur ridges that form crudely palmate extensions of erosional remnants along the flanks or nose of larger ridges. Compare - ballena, rib.

flat - (a) (adjective) Said of an area characterized by a continuous surface or stretch of land that is smooth, even, or horizontal, or nearly so, and that lacks any significant curvature, slope, elevations, or depressions. (b) (noun) An informal, generic term for a level or nearly level surface or small area of land marked by little or no local relief. Compare - mud flat. (c) (not recommended) A nearly level region that visibly displays less relief than its surroundings.

flood plain - The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

foothills - A steeply sloping upland composed of hills with relief of 30 up to 300 meters and fringes a mountain range or high-plateau escarpment. Compare - hill, mountain, plateau. SW &

footslope - The hillslope profile position that forms the concave surface at the base of a hillslope. It is a transition zone between upslope sites of erosion and transport (shoulder, backslope) and downslope sites of deposition (toeslope). Compare - summit, shoulder, backslope, and toeslope.

free face - A geomorphic component of hills and mountains consisting of an outcrop of bare rock that sheds rock fragments and other sediments to, and commonly stands more steeply than the angle of repose of, the colluvial slope immediately below; most commonly found on shoulder and backslope positions, and can comprise part or all of a nose slope or side slope. Compare - interfluve, crest, nose slope, side slope, head slope, base slope.

gorge - (a) A narrow, deep valley with nearly vertical, rocky walls, smaller than a canyon, and more steep-sided than a ravine; especially a restricted, steep-walled part of a canyon. (b) A narrow defile or passage between hills or mountains.

graben - An elongate trough or basin bounded on both sides by high-angle, normal faults that dip towards the interior of the trough. It is a structural form that may or may not be geomorphically expressed as a rift valley. Compare - horst.

gravel pit - A depression, ditch or pit excavated to furnish gravel for roads or other construction purposes; a type of borrow pit.

ground soil - Any soil at the present-day land surface and actively undergoing pedogenesis,

gulch - (colloquial: western US.; not preferred - refer to ravine) A small stream channel, narrow and steep-sided in cross section, and larger than a gully, cut in unconsolidated materials. General synonym - ravine. Compare - arroyo, draw, gully, wash.

gully - A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water usually during and immediately following heavy rains or ice / snow melt. A gully generally is an obstacle to wheeled vehicles and too deep (e.g., > 0.5 m) to be obliterated by ordinary tillage; (a rill is of lesser depth and can be smoothed over by ordinary tillage). Compare - rill, ravine, arroyo, swale, draw.

hanging valley - A tributary valley whose floor at the lower end is notably higher than the floor of the main valley in the area of junction.

head slope - A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway, resulting in converging overland water flow (e.g. sheet wash); head slopes are dominated by colluvium and slope wash sediments (e.g., slope alluvium); contour lines form concave curves. Slope complexity (downslope shape) can range from simple to complex. Headslopes are comparatively moister portions of hillslopes and tend to accumulate sediments (e.g., cummulic profiles) where they are not directly contributing materials to channel flow. Compare - side slope, nose slope, free face, interfluve, crest, base slope.

headwall - A steep slope at the head of a valley; e.g. the rock cliff at the back of a cirque. Compare - cirque headwall.

high hill - A generic name for an elevated, generally rounded land surface with high local relief, rising between 90 meters (approx. 300 ft.) to as much as 300 m (approx. 1000 ft.) above surrounding lowlands. Compare - low hill, hill, hillock.

hill - A generic term for an elevated area of the land surface, rising at least 30 m (100 ft.) to as much as 300 meters (approx. 1000 ft.) above surrounding lowlands, usually with a nominal summit area relative to bounding slopes, a well-defined, rounded outline and slopes that generally exceed 15 percent. A hill can occur as a single, isolated mass or in a group. A hill can be further specified based on the magnitude of local relief: *low hill* (30 - 90 m) or *high hill* (90 - 300 m). Informal distinctions between a hill and a mountain are often arbitrary and dependent on local convention. Compare - hillock, plateau, mountain, foothills, hills.

hillock - A generic name for a small, low hill, generally between 3 - 30 m in height and slopes between 5 and 50% (e.g., bigger than a mound but smaller than a hill); commonly considered a microfeature. Compare - mound, hill.

hillslope - A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill. Compare - mountain slope.

hogback - A sharp-crested, symmetric (homoclinal) ridge formed by highly tilted resistant rock layers; produced by differential erosion of interlayered resistant and weak rocks with dips greater than about 25 degrees (45 percent). Compare - cuesta.

hoodoo - A bizarrely shaped column, pinnacle, or pillar of rock produced by differential weathering or erosion in a region of sporadically heavy rainfall. Formation is facilitated by joints and layers of varying hardness. Compare - earth pillar.

horst - An elongate block that is bounded on both sides by normal faults that dip away from the interior of the horst. It is a structural form and may or may not be expressed geomorphically.

hummock - (a) (not preferred - see hillock). An imprecise, general term for a rounded or conical mound or other small elevation. (b) (not preferred) A slight rise of ground above a level surface.

impact crater - a) A generally circular or elliptical depression formed by hypervelocity impact of an experimental projectile or ordinance into earthy or rock material. Compare - caldera, crater, meteorite crater. SW; b) (not recommended - use meteorite crater) A generally circular crater formed by the impact of an interplanetary body (projectile) on a planetary surface.

inset fan - (colloquial; western US) The flood plain of an ephemeral stream that is confined between fan remnants, ballenas, basin-floor remnants, or closely-opposed fan toeslopes of a basin.

interdune - The relatively flat surface, whether sand-free or sand-covered, between dunes. GG

interfluve - A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways. Compare - divide.

intermittent stream - A stream, or reach of a stream, that does not flow year-round (commonly dry for 3 or more months out of 12) and whose channel is generally below the local water table; it flows only when it receives a) base flow (i.e. solely during wet periods), or b) ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. Compare - ephemeral stream.

island - (a) Land completely surrounded by water; (b) An elevated area of land surrounded by swamp, or marsh, or isolated at high water or during floods. Compare - barrier island.

knob - (a) A rounded eminence, a small hill or mountain; especially a prominent or isolated hill with steep sides, commonly found in the Southern United States. (b) A peak or other projection from the top of a hill or mountain. Also, a boulder or group of boulders or an area of resistant rocks protruding from the side of a hill or mountain. Compare - stack.

knoll - A small, low, rounded hill rising above adjacent landforms.

lake - An inland body of permanent standing water, fresh or saline, occupying a depression, generally of appreciable size (larger than a pond) and too deep to permit vegetation (excluding subaqueous vegetation) to take not completely across the expanse of water.

lakebed - (a) The flat to gently undulating ground underlain or composed of fine-grained sediments deposited in a former lake. (b) The bottom of a lake; a lake basin.

lakeshore - The narrow strip of land in contact with or bordering a lake; especially a beach.

landslide - A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials, caused by gravitational forces and which may or may not involve saturated materials. Names of landslide types generally reflect the dominant process and/or the resultant landform. The main operational categories of mass movement are *fall* (rockfall, soil fall, topple), *slide* (rotational landslide, block glide, debris slide, lateral spread), *flow* [rock fragment flow (especially rockfall avalanche), debris avalanche, debris flow (e.g., lahar), earthflow, (creep, mudflow)], and *complex landslides*. Compare - solifluction.

ledge - (a) A narrow shelf or projection of rock, much longer than wide, formed on a rock wall or cliff face, as along a coast by differential wave action on softer rocks; erosion is by combined biological and chemical weathering. (b) A rocky outcrop; solid rock. (c) A shelf-like quarry exposure or natural rock outcrop. Compare - structural bench.

levee - An artificial or natural embankment built along the margin of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel. Compare artificial levee, natural levee.

longitudinal dune - A long, narrow sand dune, usually symmetrical in cross profile, oriented parallel to the prevailing wind direction ; it is wider and steeper on the windward side but tapers to a point on the lee side. It commonly forms behind an obstacle in an area where sand is abundant and the wind is strong and constant. Such dunes can be a few meters high and up to 100 km long. Compare - seif dune, transverse dune.

low hill - A generic name for an elevated, generally rounded land surface with low local relief, rising between 30 meters (100 ft.) to as much as 90 m (approx. 300 ft.) above surrounding lowlands. Compare - high hill, hill, hillock.

lowland - (a) A generic, imprecise term for low-lying land or an extensive region of low-lying land, especially near a coast and including the extended plains or country lying not far above tide level. (b) (not preferred) A generic, imprecise term for a landscape of low, comparatively level ground of a region or local area, in contrast with the adjacent higher country. (c) (not recommended - use valley, bolson, etc.) A generic term for a large valley. Compare - upland.

marsh - Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly with sedges, cattails, rushes, or other hydrophytic plants. Compare - salt marsh, swamp, bog, fen.

meander belt - The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops. Landform components of the meander-belt surface are produced by a combination of gradual (lateral and down-valley) migration of meander loops and avulsive channel shifts causing abrupt cut-offs of loop segments. Landforms flanking the sinuous stream channel include: point bars, abandoned meanders, meander scrolls, oxbow lakes, natural levees, and flood-plain splays. Meander belts may not exhibit prominent natural levee or splay forms. Flood plains of broad valleys may contain one or more abandoned meander belts in addition to the zone flanking the active stream channel.

meander scar - (a) A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream which impinged upon and undercut the bluff; if it's no longer adjacent to the modern stream channel it indicates an

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abandoned route of the stream; (b) (not recommended - refer to oxbow) An abandoned meander, commonly filled in by deposition and vegetation, but still discernable.

meander scroll - (a) One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank. Compare - meander belt, point bar. (b) (not recommended; refer to oxbow lake) - A small, elongate lake on a flood plain in a well-defined part of an abandoned stream channel.

mesa - A broad, nearly flat-topped, and usually isolated landmass bounded by steep slopes or precipitous cliff and capped by layers of resistant, nearly horizontal, rocky summit width greater than the height of bounding escarpments. (Colloquial: western US; not preferred) Also used to designate broad structural benches and alluvial terraces that occupy intermediate levels in stepped sequences of platforms bordering canyons and valleys. Compare - butte, plateau, cuesta.

monocline - (a) A unit of folded strata that dips from the horizontal in one direction only, is not part of an anticline or syncline, and occurs at the earth's surface.. This structure is typically present in plateau areas where nearly flat strata locally assume steep dips caused by differential vertical movements without faulting. Compare - anticline, syncline, fold. (b) - A local steepening in an otherwise uniform gentle dip.

mountain - A generic term for an elevated area of the land surface, rising more than 300 meters above surrounding lowlands, usually with a nominal summit area relative to bounding slopes and generally with steep sides (greater than 25 percent slope) with or without considerable bare-rock exposed. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by tectonic activity and/or volcanic action and secondarily by differential erosion. Compare - hill, hillock, plateau, foothills, mountains.

natural levee - A long, broad low ridge or embankment of sand and coarse silt, built by a stream on its flood plain and along both sides of its channel, especially in time of flood when water overflowing the normal banks is forced to deposit the coarsest part of its load. It has a gentle slope away from the river and toward the surrounding floodplain, and its highest elevation is closest to the river bank. Compare - levee, artificial levee, meander belt.

open depression - A generic name for any enclosed or low area that has a surface drainage outlet whereby surface water can leave the enclosure; an area of lower ground indicated on a topographic map by contour lines forming an incomplete loop or basin indicating at least one surface exit. Compare - closed basin.

overbank deposit - Fine-grained sediments (silt and clay) deposited from suspension on a flood plain by floodwaters that cannot be contained within the stream channel.

overflow stream channel - A watercourse that is generally dry but conducts flood waters that have overflowed the banks of a river, commonly from large storms or annual meltwater.

oxbow - A closely looping stream meander having an extreme curvature such that only a neck of land is left between the two parts of the stream. (colloquial: northeastern A.) the land enclosed, or partly enclosed, within an oxbow. Compare - meander belt, oxbow lake, bayou.

oxbow lake - The crescent-shaped, often ephemeral body of standing water situated by the side of a stream in the abandoned channel (oxbow) of a meander after the stream formed a neck cutoff and the ends of the original bend were silted up. Compare - meander belt, oxbow.

parabolic dune - A sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind, whose ground plan, when perfectly developed, approximates the form of a parabola.

peak - Sharp or rugged upward extension of a ridge chain, usually at the junction of two or more ridges; the prominent highest point of a summit area.

pediment - A gently sloping erosional surface at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium, ultimately in transit from upland front to basin or valley lowland. In hill-foot slope terrain the mantle is designated "pedisediment." The term has been used in several geomorphic contexts: Pediments may be classed with respect to (a) landscape positions, for example, intermontane-basin piedmont or valley-border footslope surfaces (respectively, apron and terrace pediments); (b) type of material eroded, bedrock or regolith; or (c) combinations of the above. Compare - Piedmont slope.

perennial stream - A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table adjacent to the region adjoining the stream. Compare - Ephemeral stream, Intermittent stream.

piedmont - (adjective) Lying or formed at the base of a mountain or mountain range; e.g., a piedmont terrace or a piedmont pediment. (noun) An area, plain, slope, glacier, or other feature at the base of a mountain; e.g., a foothill or a bajada. In the United States, the Piedmont is a low plateau extending from New Jersey to Alabama and lying east of the Appalachian Mountains.

piedmont slope - (colloquial - western US) The dominant gentle slope at the foot of a mountain; generally used in terms of intermontane-basin terrain in arid to subhumid regions. Main components include: (a) An erosional surface on bedrock adjacent to the receding mountain front (pediment, rock pediment); (b) A constructional surface comprising individual alluvial fans and interfan valleys, also near the mountain front; and (c) A distal complex of coalescent fans (bajada), and alluvial slopes without fan form. Piedmont slopes grade to basin-floor depressions with alluvial and temporary lake plains or to surfaces associated with through drainage (e.g., axial streams). Compare - bolson, fan piedmont.

plain - A general term referring to any flat, lowland area, large or small, at a low elevation. Specifically, any extensive region of comparatively smooth and level gently undulating land. A plain has few or no prominent hills or valleys but sometimes has considerable slope, and usually occurs at low elevation relative to surrounding areas. Where dissected, remnants of a plain can form the local uplands. A plain may be forested or bare of trees and may be formed by deposition or erosion. Compare - lowland, plateau.

plateau - A comparatively flat area of great extent and elevation; specifically an extensive land region considerably elevated (more than 100 meters) above adjacent lower-lying terrain, and is commonly limited on at least one side by an abrupt descent, has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level. Compare - hill, foothill, mountain, mesa, plain.

playa - The usually dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those occurring on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation-runoff events. Playa deposits are fine grained and may or may not have high water table and saline conditions.

point bar - One of a series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander by the slow addition of individual accretions accompanying migration of the channel toward the outer bank. Compare - meander scroll.

pond - (a) A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger than a pool. (b) A small artificial body of water, used as a source of water. Compare - salt pond.

pool - A small, natural body of standing water, usually fresh; e.g. a stagnant body of water in a marsh, or a transient puddle in a depression following a rain.

quarry - Excavation areas, open to the sky, usually for the extraction of stone.

ravine - A small stream channel; narrow, steep-sided, commonly V-shaped in cross section and larger than a gully, cut in unconsolidated materials. General synonym (not preferred) - gulch. Compare - arroyo, draw, gully.

reef - (a) A ridge-like or mound-like structure, layered or massive, built by sedentary calcareous organisms, especially corals, and consisting mostly of their remains; it is wave-resistant and stands above the surrounding contemporaneously deposited sediment. Also, such a structure built in the geologic past and now enclosed in rock, commonly of differing lithology. (b) A mass or ridge of rocks, especially coral and sometimes sand, gravel, or shells, rising above the surrounding sea or lake bottom to or nearly to the surface, and dangerous to navigation; specifically such a feature at 10 fathoms (18.3 m) or less, formerly 6 fathoms (11 m).

ridge - A long, narrow elevation of the land, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

rill - A very small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water, usually during and immediately following moderate rains or after ice/snow melt. Generally, a rill is not an obstacle to wheeled vehicles and is shallow enough to be obliterated by ordinary tillage. Compare - gully.

rim - The border, margin, edge, or face of a landform, such as the curved brim surrounding the top part of a crater or caldera; specifically the rimrock of a plateau or canyon.

rise - (refer to lake plain) (a) A general term for a slight increase in slope and elevation of the land surface, usually with a broad summit and gently sloping sides. (b) same as (a) but the term is restricted to microfeatures in areas of very low relief such as lake plains or coastal plains.

river - (a) A general term for a natural, freshwater surface stream of considerable volume and generally with a permanent base flow, moving in a defined channel toward a larger river, lake, or sea. (b) (not recommended: colloquial - New England, US) A small watercourse which elsewhere in the US is known as a *creek*. Compare - stream.

river valley - an elongate depression of the Earth's surface; carved by a river during the course of it's development. Compare - valley side, valley floor.

rockfall - The process, associated sediments (rockfall deposit) or resultant landform characterized by a very rapid type of *fall* dominated by downslope movement of detached rock bodies which fall freely through the air or by leaps and bounds (lacks an underlying slip face); also spelled rock fall. Compare - debris fall, soil fall, landslide.

rock pediment - An erosion surface of low relief, cut directly into and across bedrock and composed of either bare rock or thinly veneered pedisediment or residuum (e.g. < 1.5 m) over bedrock; it occurs along the flanks of mountain fronts, or at the base of mountains or high hills. Its surface grades to the backwearing mountain slopes or hillslopes above, and generally grades down to and merges with a lower-lying alluvial plain, piedmont slope or valley floor below.

rotational slide - The process, associated sediments (rotational landslide deposit) or resultant landforms characterized by an extremely slow to moderately rapid type of slide, composed of comparatively dry and largely soil-rock materials, portions of which remain largely intact and in which movement occurs along a well-defined, concave shear surface and resulting in a backward rotation of the displaced mass. The landform may be single, successive (repeated up and down slope), or multiple (as the number of slide components increase). Compare - rotational debris slide, rotational earth slide, rotational rock slide, translational slide, lateral spread, landslide.

rubble - An accumulation of loose angular rock fragments, commonly overlying outcropping rock; the unconsolidated equivalent of a breccia. Compare - scree, talus.

saddle - A low point on a ridge or interfluve, generally a divide (pass, col) between the heads of streams flowing in opposite directions. Compare - summit, crest.

sandhills - A region of semi-stabilized sand dunes or sandy hills, either covered with vegetation or bare, as in north-central Nebraska and the midlands of the Carolinas.

sand plain - (a) A sand-covered plain which may originate by deflation of sand dunes, and who's lower limit of erosion is governed by the ground-water level. Also spelled *sandplain.* (b) (not preferred - refer to *sandy* outwash plain) A small outwash plain composed chiefly of sand deposited by meltwater streams flowing from a glacier.

sand ramp - A sand sheet blown up onto the lower slopes of a bedrock hill or mountain and forming an inclined plane, sometimes filling small mountain-side valleys and even crossing low passes. Compare - climbing dune, sand sheet.

sand sheet - A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

scarp - An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height. Compare - escarpment.

scarp slope - The relatively steeper face of a cuesta, facing in a direction opposite to the dip of the strata. Compare - dip slope.

scree - A collective term for an accumulation of coarse rock debris or a sheet of coarse debris mantling a slope. Scree is not a synonym of talus, as scree includes loose, coarse fragment material on slopes without cliffs. Compare - talus, colluvium, mass movement.

scree slope - A portion of a hillside or mountainslope mantled by scree and lacking an up-slope rockfall source (i.e. cliff). Compare - talus slope, scree, talus.

seep - (noun) An area, generally small, where water or oil percolates slowly to the land surface. For water, it may be considered as a seepage spring, but it is used by some for flows too small to be considered as springs.

shoulder - The hillslope profile position that forms the convex, erosional surface near the top of a hillslope. If present, it comprises the transition zone from summit to backslope. Compare - summit, crest, backslope, footslope, and toeslope.

shrub-coppice dune - A small, streamlined dune that forms around brush and clump vegetation.

side slope - A laterally planar area of a hillside, resulting in predominantly parallel overland water flow (e.g., sheet wash); contour lines generally form straight lines. Side slopes are dominated by colluvium and slope wash sediments. Slope complexity (downslope shape) can range from simple to complex. Compare - head slope, nose slope, free face, interfluve, crest, base slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluve. It is generally linear along the slope width.

slide - (a) Mass movement processes, associated sediments (slide deposit) or resultant landforms (e.g., rotational, translational, and snow slide) characterized by a failure of earth, snow, or rock under shear stress along one or several surfaces that are either visible or may reasonably be inferred. The moving mass may or may not be greatly deformed, and movement may be rotational (rotational slide) or planar (translational slide). A slide can result from lateral erosion, lateral pressure, weight of overlying material, accumulation of moisture, earthquakes, expansion owing to freeze-thaw of water in cracks, regional tilting, undermining, fire, and human agencies. Compare -fall, topple, lateral spread, flow, complex landslide. (b) The track of bare rock or furrowed earth left by a slide. (c) The mass of material moved by or deposited by a slide.

slip face - The steeply sloping surface of a dune, standing at or near the angle of repose of loose sand, and advancing downwind by a succession of slides wherever that angle is exceeded.

slope - (also called slope gradient or gradient) The inclination of the land surface from the horizontal. Percent slope is the vertical distance divided by the horizontal distance, then multiplied by 100.

slope alluvium - Sediment gradually transported down mountain or hill slopes primarily by non-channel alluvial processes (i.e., slope wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated by stone lines. Sorting of pebbles or cobbles and burnished peds distinguish these materials from unsorted colluvial deposits. Compare - colluvium, slope wash.

slope wash - A collective term for non-fluvial, incipient alluvial *processes* (e.g. overland flow, minor rills) that detach, transport, and deposit sediments down hill and mountain slopes. Related sediments (*slope alluvium*) exhibit nominal sorting or rounding of particles, peds, etc., and lateral sorting downslope on long slopes; stratification is crude and intermittent and readily destroyed by pedoturbation and frost action. Also called *slope wash processes*. Compare - slope alluvium, colluvium, valley-side alluvium.

slot canyon - A long, narrow, deep and tortuous channel or drainageway with sheer rock walls eroded into sandstone or other sedimentary rocks, especially in the semi-arid western US (e.g. Colorado Plateau); subject to flash flood events; depth to width ratios exceed 10:1 over most of its length and can approach 100:1; commonly containing unique ecological communities distinct from the adjacent, drier uplands.

strath terrace - A type of stream terrace, formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

stream - (a) A body of running water that moves under gravity to progressively lower levels, in a relatively narrow but clearly defined channel on the ground surface, in a subterranean cavern, or beneath or in a glacier. It is a mixture of water and dissolved, suspended, or entrained matter. (b) A term used in quantitative geomorphology interchangeably with channel. Compare - river.

stream terrace - One or a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition (i.e., currently very rarely or never floods; inactive cut and fill and/or scour and fill processes). Erosional surfaces cut into bedrock and thinly mantled with stream deposits (alluvium) are called "strath terraces." Remnants of constructional valley floors thickly mantled with alluvium are called alluvial terraces. Compare - alluvial terrace, flood-plain step, strath terrace, terrace.

strike valley - A subsequent valley eroded in, and developed parallel to the strike of, underlying weak strata; such as a cuesta; a valley that often, but not necessarily contains a strike valley.

structural bench - A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude. Structural benches are bedrock controlled, and in contrast to stream terraces, have no geomorphic implication of former, partial erosion cycles and base-level controls, nor do they represent a stage of flood-plain development following an episode of valley trenching. Compare - pediment, ledge; see scarp.

summit - (a) The topographically highest position of a hillslope profile with a nearly level (planar or only slightly convex) surface. Compare - shoulder, backslope, footslope, and toeslope, crest. (b) A general term for the top, or highest area of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluve area of relatively gentle slope that is flanked by steeper slopes, e.g., mountain fronts or tableland escarpments.

swale - (a) A shallow, open depression in unconsolidated materials which lacks a defined channel but can funnel overland or subsurface flow into a drainageway. Soils in swales tend to be more moist and thicker (cummulic) compared to surrounding soils. (b) A small, shallow, typically closed depression in an undulating ground moraine formed by uneven glacial deposition; Compare - swell-and-swale topography. (c) (not preferred; refer to interdune) A long, narrow, generally shallow, trough-like depression between two beach ridges, and aligned roughly parallel to the coastline.

syncline - (a) A unit of folded strata that is concave upward whose core contains the stratigraphically younger rocks, and occurs at the earth's surface. In a single syncline, beds forming the opposing limbs of the fold dip toward its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally concave upward whose core contains the stratigraphically younger rocks.

tableland - A term for a broad upland with an extensive, nearly level or undulating summit area and steep side slopes descending to surrounding lowlands. Compare - plateau, mesa, cuesta.

talus - Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of loose broken rock formed chiefly by falling, rolling, or sliding. Compare - talus slope, colluvium, mass movement, scree.

talus cone - A small, steep, cone-shaped landform at the base of a cliff or escarpment, that heads in a relatively small declivity or ravine, and composed of poorly sorted rock and soil debris that has accumulated primarily by episodic rockfall or, to a lesser degree, by slope wash. Not to be confused with an *alluvial cone*; a similar feature but of fluvial origin, composed of better stratified and more sorted material, and that tapers up into a more extensive drainageway. Compare - alluvial cone, beveled base, talus slope.

talus slope - a portion of a hillslope or mountainslope mantled by talus and lying below a rockfall source (e.g. cliff). Compare - scree slope, scree, talus. Compare - beveled base.

tank - (colloquial: southwestern US) A natural depression or cavity in impervious rocks in which water collects and remains for the greater part of the year.

terrace - A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, or lake or sea shore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper slope (scarp, riser), descending to a lower base level. Compare - stream terrace, flood-plain step. Practically, terraces are considered to be generally flat alluvial areas above the 100 yr. flood stage.

terracettes - Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock such as sheep or cattle. Synonyms (not preferred) - catstep, sheep or cattle track.

toeslope - The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hill-slope continuum that grades to valley or closed-depression floors. Compare - summit, shoulder, backslope, footslope, valley floor.

translational slide - A category of mass movement processes, associated sediments (translational slide deposit) or resultant landforms characterized by the extremely slow to moderately rapid downslope displacement of comparatively dry soil-rock material on a surface (slip face) that is roughly parallel to the general ground surface, in contrast to falls, topples, and rotational slides. The term includes such diverse *slide* types as translational debris slides, translational earth slide, translational rock slide, block glides, and slab or flake slides. Compare - rotational slide, slide, landslide.

transverse dune - A very asymmetric sand dune elongated perpendicular to the prevailing wind direction, having a gentle windward slope and a steep leeward slope standing at or near the angle of repose of sand; it generally forms in areas of sparse vegetation. Compare - longitudinal dune.

valley - An elongate, relatively large, externally drained depression of the Earth's surface that is primarily developed by stream erosion or glacial activity. Compare - basin.

valley floor - A general term for the nearly level to gently sloping, lowest surface of a valley. Landforms include axial stream channels, the flood plain, flood-plain steps, and, in some areas, low terrace surfaces. Compare - flood-plain landforms, meander, braided channel, valley side.

valley side - The sloping to very steep surfaces between the valley floor and summits of adjacent uplands. Well-defined, steep valley sides have been termed valley walls (not recommended). Note: Scale, relief, and perspective may require use of closely related terms such as hill slope or mountain slope.

wash (dry wash) - (colloquial: western US.) The broad, flat- floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium. Note: When channels reach intersect zones of ground-water discharge they are more properly classed as "intermittent stream" channels. Synonym - arroyo. Compare - gully.

zibar - A small, low-relief sand dune that lacks discernible slip faces and commonly occurs on sand sheets, in interdune areas, or in corridors between larger dunes. Zibar spacing can range from 50-400 m with local relief < 10 m. Unlike coppice dunes, zibars are unrelated to deposition around vegetation. Generally dominated by coarse sand. Compare - dune, coppice dune.

CONSIDERATIONS FOR PLANNING

Planning for the day:

1. Safety and sustenance: Plenty of food, water, first-aid kit, raingear, sunscreen.
2. Field communications:
   a. Develop a plan with team-mate for check-in time.
   b. Does park staff know the area in which you will be working?
3. Make sure you have the right maps and photos.
4. Check your GPS receiver (Datum set to NAD83? WAAS on? Needs new batteries?).
5. Plan the day's mission before departing using a) USGS quads, b) aerial photos, c) Park/BLM/FS maps.
6. Considerations for mission planning:
   a. Plan travel based on topography, best access routes, density and complexity of vegetation (more time for forest and woodland sites, less for herbaceous and shrub).
   b. Plan data collection based on priority needs; new types get higher priority.
   c. Communicate to make sure you aren't duplicating effort when unnecessary.

Planning for the Week (do this on the first day of the trip)

1. Do you have all appropriate maps, photos?
2. Develop a reasonable estimate of the number of plots for each team broken up by day and based on an estimate of individual team's travel logistics for the week.
3. Develop plan of attack for the week to capture all essential associations in the work area.
4. Balance points two and three above with the expected work schedule of the teams and ensure adequate time-off and reduce over-time concerns.
5. Do you have all necessary information and backups for the week's planning? E.g., blank field forms, film, plenty of batteries.

Wrapup

1. Clean, recharge and repair equipment.
2. Hold brief meeting to discuss data collection issues, things that came up during the day/week, and plan for next days activities.
3. Edit field forms and file them systematically.
4. Re-file the aerial photos and maps.
5. Download flashcards.
6. Key unknown plants.
7. Enter edited data into database.

Communicate among teams / Topics for wrap-up meetings.

1. What were your questions about the sites visited daily/weekly?
2. Do you have any questions about the forms or fields?
3. What was accomplished, what was not accomplished?
4. Pass on developments and questions, e.g., were there problems with interpreting the aerial photos, or are there personnel issues, problems in consistency in interpreting the forms, or with park-related logistics?

Materials Checklist

- Site research permit
- Topo maps
- Site maps for general navigation
- Digital orthophoto for easy reference
- Geology map
- Aerial photos
- Compass with adjustable declination
- Clinometer
- GPS receiver
- Plenty of AA batteries for GPS receivers, walkie talkies, etc.
- Radio or walkie talkie and/or cell phone
- Digital camera and flash cards
- Baggies for temporary storage of unknown plants, and masking tape for labeling
- Plant press & paper
- Plant Keys / Flora(s)
- Pens / sharpies
- Forms: observation point
- Clipboard/forms holder
- Pens, pencils, pencil lead, slate board, chalk, and chalkboard eraser
- Most recent version of provisional classification of the park
- All ancillary information (cheat sheet, species list, floras, main sampling protocol).
- First aid kit, personal gear (food, water, rain gear, etc.)

ATTACHMENT B

DESCRIPTION OF FEDERALLY LISTED SPECIES

(*IN ALPHABETICAL ORDER BY COMMON NAME*)

Black-Capped Vireo *(Verio atricapilla)*
Val Verde County

The black-capped vireo was listed as a Federally endangered bird on October 6, 1987.

Distribution: They are found through the Edwards Plateau and eastern Trans-Pecos region of Texas.

Natural History:

The black-capped vireo is 4.5 inches long. The male black-capped vireo has a black cap and has red eyes surrounded by white spectacles that are interrupted with black above the eye. The back is olive green, and underparts are mostly white with olive- and yellow-tinged flanks. Wings and back are dark olive to blackish with two pale yellow wingbars. Females and juveniles are similar to males but have a gray cap and a brown iris.

Habitat: Preferred habitat is rangelands with scattered clumps of shrubs separated by open grassland.

Breeding: Black-capped vireos nest in Texas during April through July, and spend the winter on the western coast of Mexico. They build a cup-shaped nest in the fork of a branch 2 to 4 feet above the ground. Nests are usually built in shrubs such as shin oak or sumac. Females lay 3–4 eggs, which hatch in 14–17 days. Both parents incubate the eggs and feed the chicks. Their diet consists of insects. Black-capped vireos have a lifespan of 5–6 years. Males sing to attract mates and defend territories, which are usually 2 to 4 acres. Vireos return year after year to the same area to nest.

Threats: Black-capped vireos are endangered because the low growing woody cover they need for nesting has been cleared or overgrazed by livestock and deer. One of the primary threats to black-capped vireos is the brown-headed cowbird, which lays its eggs in vireo nests and causes vireos to abandon their nest (brood parasitism) (TPWD).

Texas Parks and Wildlife Department on-line fact sheet accessed at:
http://www.tpwd.state.tx.us/huntwild/wild/species/bcv/

Brown Pelican (*Pelecanus occidentalis*)

Val Verde County

The brown pelican was listed as endangered on October 13, 1970.

Distribution: The brown pelican's historical range included the Atlantic and Gulf coasts from South Carolina to Florida and west to Texas. Currently, the brown pelican occurs throughout its historic range but in greatly reduced numbers. Within Texas, numbers dropped drastically from an estimated 5,000 birds in 1918 to less than 100 individuals and only 10 breeding pairs in 1974. According to a 2003 survey, there were 8 colonies and 3,895 active nests in Texas. Today, brown pelicans are found along the Texas coast from Chambers County on the upper coast to Cameron County on the lower coast. Most of the breeding birds nest on Pelican Island in Corpus Christi Bay and Sundown Island near Port O'Connor.

Natural History:

Habitat: The brown pelican is a coastal bird that is rarely seen inland or far out at sea. It feeds in shallow estuarine waters usually less than 40 miles from shore. Pelicans use sand spits, offshore sand bars, and islets for roosting and rest.

Breeding: Egg laying times vary with the location of the brown pelican. In Texas, brown pelican populations nest irregularly, usually beginning in late fall and extending through June. The clutch size averages 2–3, and incubation lasts 28-30 days. The young pelicans leave the nests around 35 days after hatching, fledge around 63 days after hatching, and fly around 71–88 days after hatching. Reproductive success is highly variable and susceptible to disturbance by humans, starvation of young, and/or flooding of nests. In Texas, brown pelicans build their nests on small isolated coastal islands that are safe from predators such as raccoons and coyotes.

Diet: The brown pelican is a piscivore that primarily feeds upon menhaden and mullet in Texas. They spot the fish from above and the dive beak-first into the water to scoop up the fish.

Threats: The brown pelican has undergone several sharp population declines in Texas. The first decline occurred in the 1920–1930s, when local fishermen will kill the birds because of incorrect assumptions that the brown pelican competed with humans for fish. The second sharp decline occurred in the 1960s and 1970s when the brown pelicans ate menhaden tainted with DDT and Endrin, causing a severe decline in reproductive success. Currently, human encroachment and development of the Texas coast provides the most significant threat to brown pelican populations.

Devils River Minnow (*Dionda diaboli*)

Val Verde County

The Devils River minnow was listed as Federally threatened on March 20, 1999.

Distribution: The Devils River minnow is found in channels of fast-flowing, spring-fed waters over gravel substrates. It most often occurs where spring flow enters a stream. Historically, it was known to occur in Del Rio in the Rio Grande. Its last occurrence in the Rio Grande as it flows though Del Rio is not reported.

Natural History: It is a small fish, with adults reaching approximately 2 inches in length. It occurs with other similar minnows and is believed to feed on algae. Little is known about its life history. They spawn from January to August, depositing eggs near the stream bottom. Life expectancy is estimated to be 1 to 2 years.

Threats: The primary threats for this species are habitat loss, water quality degradation, and impacts from nonnative species.

Texas parks and Wildlife Department on-line fact sheet accessed at:
http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0013_devils_river_minnow.pdf

Gray Wolf (*Canis lupus*)

Maverick County

The Gray wolf was listed as Federally endangered on March 11, 1967.

Distribution: Currently extirpated from Texas.

Description: The gray wolf is a close relative of domestic dogs. Its thick fur ranges in color from creamy white or reddish-brown to shades of gray and black. Gray wolves are the largest species of wolf and can reach 50–90 pounds and 4–5 feet long. Adult males are larger than adult females.

Gray wolves breed once a year. They mate in late winter, and pups are born in the spring. Dens are usually ground burrows excavated in slopes where rocks will function to support the roof of the tunnel and burrow. Both parents and other pack members, if present, will bring food to the young, which average about 5 pups in a litter. The bond between mated wolves is very strong and commonly lasts their lifetime. Gray wolves can live up to 15 years.

Gray wolves are carnivores that prey on large herbivores such as deer and Pronghorn antelope, but they will also eat rabbits, ground squirrels, and mice. The decline of the gray wolf has been attributed mostly to predator control by humans. In the late 1800s and early 1900s, ranchers killed wolves to prevent loss of livestock and wild ungulates such as deer. In those days, even people living in the towns and cities feared wolves and applauded their demise. Predator control was so successful that few individuals remained. Reintroduction efforts of captive-bred individuals have been difficult to initiate due to residual fears for livestock and people, as well as a lack of large, remote tracts of suitable habitat.

Natural History:

Habitat: Gray wolves are found in forests, brushlands, or grasslands where suitable cover and denning sites are available.

Threats: The primary factors behind extirpation of the gray wolf from its range was loss of habitat and widespread hunting, both for sport and to protect livestock.

Texas Parks and Wildlife Department, Gray Wolf Species Profile. 2007. Accessed on-line at: *http://www.tpwd.state.tx.us/huntwild/wild/species/graywolf/*

Gulf Coast Jaguarundi (*Herpailurus yagouaroundi cacomitli*)

Maverick County

The Gulf Coast jaguarundi was listed as endangered on June 14, 1976.

Distribution: Because of the secretive nature of the jaguarundi, little is known about its exact distribution within Texas. The only documented sighting of a jaguarundi in Texas was a road killed specimen found in Cameron County. Jaguarundi still roam Central and South America in greater numbers than seen in the United States (USFWS 1990).

Natural History:

Habitat: The habitat of the jaguarundi is similar to the ocelot's. It is found within the Tamaulipan Biotic Province, which includes several variations of sub-tropical thornscrub brush. Potential habitat includes four different areas of the Lower Rio Grande Valley: Mesquite-Granjeno Parks, Mesquite-Blackbrush Brush, Live Oak Woods/Parks, and Rio Grande Riparian. Jaguarundi prefer dense thornscrub habitats with greater than 95 percent canopy cover. Their minimal home range is about 40 hectares (ha) (USFWS 1990).

Breeding: The jaguarundi mates in November or December, and gestation lasts 9–10 weeks. There may be two litters of 1–4 (average 2) young per year. In Mexico, the young are born between March and August. Little is known of the breeding habits within the United States.

Diet: The jaguarundi is active at night and preys primarily on birds, small rodents, and rabbits.

Threats: The largest threat to jaguarundi populations in the United States is habitat loss and fragmentation in southern Texas. The jaguarundi requires a large hunting area, and appropriate habitat is being lost to development and agriculture. This creates islands of habitat where the jaguarundi cannot migrate from area to area, leaving them vulnerable.

U.S. Fish and Wildlife Service. 1990. *Listed Cats of Texas and Arizona Recovery Plan (With Emphasis on the Ocelot).* U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

Interior Least Tern (*Sterna antillarum athalassos*)

Maverick and Val Verde County

The interior population of the least tern was listed as endangered on June 27, 1985.

Distribution: The historic breeding range of the least tern included the Mississippi and Red Rivers and the Rio Grande. The breeding range extended from Texas to Montana, and from eastern Colorado and New Mexico to southern Indiana. Currently, the least tern maintains breeding grounds on all these river systems, although suitable habitat has dwindled. In Texas, populations have been observed on the Red River system and along the Texas/Oklahoma border as far east as Burkburnett, Texas. Least terns have been observed on three reservoirs (including Amistad Reservoir in Val Verde County) along the Rio Grande and along the Pecos River at the Bitter Lake National Wildlife Refuge, New Mexico (USFWS 1990).

Natural History:

Habitat: Along river systems such as the Rio Grande, least terns nest on sparsely vegetated sand and gravel bars along a wide, unobstructed river channel or salt flats along lake shorelines. Least terns also have been observed to nest on artificial habitats such as sand and gravel pits and dredge islands (USFWS 1990).

Breeding: Least terns reside on the breeding grounds for 4–5 months, arriving from late April to early June. Nests are shallow depressions in open, sandy areas, gravelly patches, or exposed flats. The tern nests in colonies. Clutch size is usually 2–3 eggs, and the eggs are laid by late May. Incubation lasts 20–25 days, and fledging occurs after three weeks. Parental attention continues until migration at the end of the breeding season (USFWS 1990).

Diet: The least tern is a fish eater that hunts in the shallow waters of rivers, streams, and lakes. Fish prey is small-sized and include the following genera: *Fundulus, Notropis, Campostoma, Pimephales, Gambusia, Blonesox, Morone, Dorosoma, Lepomis* and *Carpiodes.* They usually hunt near their nesting sites (USFWS 1990).

Threats: The taming of wild river systems for irrigation, navigation, hydroelectric power, and recreation has altered the river channels that the least tern depends on for breeding grounds. Stabilized river systems eliminate most of the sandbars that terns utilize for breeding grounds by channeling wide, braided rivers into single, narrow navigation channels.

U.S. Fish and Wildlife Service. 1990. *Recovery plan for the interior population of the least tern (Sterna antillarum).* U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 90 pp.

Ocelot (*Leopardus [=Felis] pardalis*)

Maverick County

The ocelot was listed as endangered on March 28, 1972.

Distribution: The ocelot is found from northern Mexico into the southern extremes of Texas and Arizona to northern Argentina, Paraguay, and Uruguay. Little is known of the exact distribution of the ocelot in Texas. Ocelots recorded by trapping or photo documentation include several areas within five counties in Texas: Cameron, Willacy, Kenedy, Jim Wells, and Hidalgo.

Natural History:

Habitat: The habitat of the ocelot is found within the Tamaulipan Biotic Province, which includes several variations of sub-tropical thornscrub brush. Potential habitat includes four different areas of the Lower Rio Grande Valley: Mesquite-Granjeno Parks, Mesquite-Blackbrush Brush, Live Oak Woods/Parks, and Rio Grande Riparian. Ocelots prefer dense thornscrub habitats with greater than 95 percent canopy cover. Their average home range is about 15 km^2 (USFWS 1990).

Breeding: In Texas, the ocelot breeds in late summer, with gestation lasting about 70 days. Births occur in fall and winter, and the litter size is 2–4. Dens are found in caves, hollow trees, thickets, or the spaces between closed buttress roots of large trees (NatureServe). Juveniles appear to travel with their mother even after lactation has ceased, and one study found two young females up to 2 years old with home ranges that significantly overlapped their mother's home range (USFWS 1990).

Diet: The ocelot is active at night and preys primarily on birds, small rodents, and rabbits, but may also eat reptiles, fish, and invertebrates. Other potential prey species include other rodents, opossum, raccoon, javelina, white-tailed deer, skunks, nine-banded armadillo, feral swine, poultry, quail, doves, chachalaca, numerous passerine birds and waterfowl, snakes, and lizards.

Threats: Habitat loss and fragmentation, especially along the Rio Grande, pose a critical threat to the long-term survival of the ocelot. Efforts need to be taken to preserve key habitat and biological corridors necessary for ocelot survival (USFWS 1990).

U.S. Fish and Wildlife Service. 1990. *Listed Cats of Texas and Arizona Recovery Plan (With Emphasis on the Ocelot).* U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

Rio Grande Silvery Minnow (*Hybognathus amarus)*

Maverick County

The Rio Grande silvery minnow was listed as a Federally endangered fish on July 20, 1994.

Distribution: Historically the Rio Grande silvery minnow occurred in the Rio Grande and Pecos River systems in Texas, New Mexico, and Mexico. Its range is currently drastically reduced, and it occurs only in perennial sections of the Rio Grande in New Mexico (NatureServe 2007).

Natural History:

Habitat: This minnow prefers large freshwater streams with slow to moderate current over mud, sand, or gravel bottoms, perennial sections of the Rio Grande, and irrigation canals (Sublette et al. 1990). It spawns probably in still waters over sandy-silt bottoms (Sublette et al. 1990) (NatureServe).

Diet: The diet of the Rio Grande silvery minnow is assumed to be the same as others in the Genus Hybognathus: diatoms, algae, larval insect skins, and plant material scraped from ooze in bottom sediment (Sublette et al. 1990) (NatureServe).

Threats: Survival continues to be threatened by habitat degradation and flow modifications, introduction of nonnative fishes, and lack of adequate refugia during periods of low or no flow (NatureServe).

NatureServe. 2007. Rio Grande Silvery Minnow. Accessed on-line at: *http://www.natureserve.org*

USFWS. 2007. Draft Revised Recovery Plan. *http://ecos.fws.gov/docs/recovery_plan/070118a.pdf*

Texas Hornshell (*Popenaias popeii*)

Val Verde County

The Texas hornshell mollusk is Federally listed as a candidate species—that is, a species for which the USFWS has enough substantial information to warrant listing as threatened or endangered.

Distribution: The Texas hornshell has only been confirmed in Texas in the Laredo area of the Rio Grande. Historically, it occurred in the lower Pecos River of New Mexico, and downstream throughout the lower Rio Grande.

Natural History: The Texas hornshell is a freshwater mussel. The shell has a length to height ratio of 1.8, is anteriorly rounded and narrow, and posteriorly slightly truncated and wider. Adults are filter feeders, whereas juveniles use foot feeding, thereby being suspension feeders that feed on algae and detritus. The Texas hornshell can live up to a maximum of 200 years.

Threats: The primary threat to Texas hornshells and other freshwater mussels is the destruction or modification of the physical conditions of the river. Modifications include impoundments, water diversions, dams, agriculture irrigation, and levees that modify riffle and shoal habitats; alter the natural flow regime of the river; and prevent natural reproductive grounds for the mussel. Increased siltation, contaminants, and salinity caused by agriculture returns to the river and other human activities create unsuitable conditions for the mussel (USFWS 2005).

U.S. Fish and Wildlife Service. *Species Assessment and Listing Priority Assignment Form.* Accessed on-line at:
http://ecos.fws.gov/docs/candforms_pdf/r2/F02M_I01.pdf

Texas Snowbells (*Styrax texana*)

Val Verde County

The Texas snowbells shrub or small tree was Federally listed as endangered on October 12, 1984.

Distribution: Western Edwards Plateau in Edwards, Real, and Val Verde Counties.

General Description: This shrub or small deciduous tree grows about 5 to 15 feet tall. It has light green leaves that are silver-white underneath. This contrast in colors on the leaves make the plant appear to shimmer when the wind blows. The flowers are clustered at the end of the branch and hang upside down.

Natural History:

Morphology: Flower buds develop in March and open during the third and fourth weeks of April. Flowering peaks during the last week in April. Fruit capsules, containing up to 3 seeds, swell in late July and early August, and split open in late August through September, dropping the shiny brown, pea-sized seeds. The tree is often found growing with Texas ash, sycamore, little walnut, Mexican silktassel, Lacey oak, Texas oak, Mexican-buckeye, Texas mountain laurel, Texas persimmon, guajillo, and Ashe juniper (TPWD 2007).

Habitat: Texas snowbells grow out of crevices on steep limestone bluffs or cliff faces along streams and dry creek beds. They can also grow in the dry gravels of streambeds or on thin soils overlying limestone ledges.

Threats: Texas snowbells are readily eaten by livestock, exotic ungulates, and deer. Over-browsing by these animals is a serious threat to its survival. Young seedlings are often eaten by browsing animals or insects.

Texas parks and Wildlife Department. On-line fact sheet accessed at:
http://www.tpwd.state.tx.us/huntwild/wild/species/snowbell/

Texas A&M Ornamental Gardening. On-line fact sheet access at:
http://aggie-horticulture.tamu.edu/ornamentals/nativeshrubs/styrax percent20texan.htm

Tobusch Fishhook Cactus (*Ancistrocactus tobuschii*)

Val Verde County

The Tobusch fishhook cactus was Federally listed as endangered in November 1979. It was listed as a state of Texas endangered species in April 1983.

Distribution: This cactus is endemic to Edwards Plateau of central Texas and known to occur in eight counties in Texas. As of February 1996, fewer than 50 populations are known in Texas.

General Description: The stem of the cactus is generally one dark green, flattened hemisphere, growing up to 4 inches in diameter and height. The stem is covered with tubercules. The spines are yellowish, and can be red-tipped and turn gray as the cactus ages.

Natural History:

Morphology: The Tobusch fishhook cactus can flower from mid-January to late March. The flowers are clear, bright yellow, and can be a creamy yellow or yellowish-green when first opening.

Habitat: The habitat for the Tobusch fishhook cactus consists of patchy openings scattered within woodlands, shrublands, and grasslands. It tends to occur on shallow, gravelly soil over limestone within openings among live oak-juniper woodlands.

Threats: The conversion of plant communities to improve pastures, overgrazing, and vulnerability due to low population numbers are all threats.

Texas Parks and Wildlife Department. Tobusch Fishhook Cactus. Accessed on-line at:
http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_lf_w7000_0019b.pdf

ATTACHMENT C
GIS PRODUCTS

GIS PRODUCTS

GIS Interactive File

Access Database for PF225

GIS Layer: Vegetation Database

Maps Including Vegetation Layer

Field Photographs

ATTACHMENT D

SPECIES LISTS OF DEL RIO SECTOR

Birds of the Del Rio Sector

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Accipitridae				
Accipiter cooperii	Cooper's Hawk	G5/S4		
Accipiter striatus	Sharp-shinned Hawk	G5/S2		
Aquila chrysaetos	Golden Eagle	G5/S3		
Asturina (Buteo) nitidus	Gray Hawk	G5/S2	T	
Buteo albicaudatus	White-tailed Hawk	G4G5/S4	T	
Buteo albonotatus	Zone-tailed Hawk	G4/S3	T	
Buteo jamaicensis	Red-tailed Hawk	G5/S5		
Buteo lineatus	Red-shouldered Hawk	G5/S4		
Buteo playpterus	Broad-winged Hawk	G5/S3		
Buteo regalis	Ferruginous Hawk	G4/S2		
Buteo swainsoni	Swainson's Hawk	G5/S4		
Buteogallus anthracinus	Common Black-Hawk	G4G5/S2	T	
Circus cyaneus	Northern Harrier	G5/S2		
Elanoides forficatus	Swallow-tailed Kite	G5/S2	T	
Elanus leucurus	White-tailed Kite	G5/S4		
Haliaeetus leucocephalus	Bald Eagle	G5/S3	T	
Ictinia mississippiensis	Mississippi Kite	G5/S4		
Pandion haliaetus	Osprey	G5/S4		
Parabuteo unicinctus	Harris's Hawk	G5/S3		
Alaudidae				
Eremophila alpestris	Horned Lark	G5/S5		
Alcedinidae				
Ceryle (Megaceryle) torquata	Ringed Kingfisher	G5/S3		
Ceryle (Megacryle) alcyon	Belted Kingfisher	G5/S5		
Chloroceryle Americana	Green Kingfisher	G5/S4		
Anatidae				
Aix sponsa	Wood Duck	G5/S4		
Anas acuta	Northern Pintail	G5/S3		
Anas Americana	American Wigeon	G5/S3		
Anas clypeata	Northern Shoveler	G5/S3		
Anas crecca	Green-winged Teal	G5/S2		
Anas cyanoptera	Cinnamon Teal	G5/S3		
Anas discors	Blue-winged Teal	G5/S3		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Anas fulvigula	Mottled Duck	G4/S4		
Anas Penelope	Eurasian Wigeon	G5/No TX Record		
Anas platyrhynchos	Mallard	G5/S3		
Anas strepera	Gadwall	G5/S3		
Anser albifrons	Greater White-fronted Goose	G5/S5		
Aythya affinis	Lesser Scaup	G5/S3		
Aythya Americana	Redhead	G5/S3		
Aythya collaris	Ring-necked Duck	G5/No TX Record		
Aythya marila	Greater Scaup	G5/No TX Record		
Aythya valisineria	Canvasback	G5/S4		
Branta Canadensis	Canada Goose	G5/S5		
Bucephala albeola	Bufflehead	G5/No TX Record		
Bucephala clangula	Common Goldeneye	G5/No TX Record		
Chen caerulescens	Snow Goose	G5/S5		
Chen rossii	Ross' Goose	G4/S3		
Clangula hyemalis	Long-tailed Duck	G5/No TX Record		
Cygnus columbianus	Tundra Swan	G5/No TX Record		
Dendrocygna autumnalis	Black-bellied Whistling-Duck	G5/S5		
Dendrocygna bicolor	Fulvous Whistling-Duck	G5/S4		
Lophodytes cucullatus	Hooded Merganser	G5/S3		
Melanitta fusca	White-winged Scoter	G5/No TX Record		
Melanitta perspicillata	Surf Scoter	G5/No TX Record		
Mergus merganser	Common Merganser	G5/No TX Record		
Mergus serrator	Red-breasted Merganser	G5		
Nomonyx dominicus	Masked Duck	G5/S3		
Oxyura jamaicensis	Ruddy Duck	G5/S3		
Anhingidae				
Anhinga anhinga	Anhinga	G5/S4		
Apodidae				
Chaetura pelagica	Chimney Swift	G5/S3		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Ardeidae				
Ardea albus	Great Egret	G5/S5		
Ardea herodias	Great Blue Heron	G5/S5		
Botaurus lentiginosus	American Bittern	G4/S3		
Bubulcus ibis	Cattle Egret	G5/Exotic		
Butorides virescens	Green Heron	G5/S5		
Egretta caerula	Little Blue Heron	G5/S5		
Egretta rufescens	Reddish Egret	G4/S3	T	
Egretta thula	Snowy Egret	G5/S5		
Egretta tricolor	Tricolored Heron	G5/S5		
Ixobrychus exilis	Least Bittern	G5/S4		
Nyctanassa violacea	Yellow-crowned Night-Heron	G5/S4		
Nycticorax nycticorax	Black-crowned Night-Heron	G5/S4		
Bombycillidae				
Bombycilla cedrorum	Cedar Waxwing	G5/N5		
Caprimulgidae				
Caprimulgus carolinensis	Chuck-will's-widdow	G5/S3		
Caprimulgus vociferous	Whip-poor-will	G5/S4		
Chordeiles acutipennis	Lesser Nighthawk	G5/S4		
Chordeiles minor	Common Nighthawk	G5/S4		
Phalaenoptilus nuttallii	Common Poorwill	G5/S4		
Cardinalidae				
Cardinalis cardinalis	Northern Cardinal	G5/S5		
Cardinalis sinuatus	Pyrrhuloxia	G5/S4		
Passerina amoena	Lazuli Bunting	G5/S3		
Passerina caerulea	Blue Grosbeak	G5/S4		
Passerina ciris	Painted Bunting	G5/S4		
Passerina cyanea	Indigo Bunting	G5/S5		
Passerina versicolor	Varied Bunting	G5/S4		
Pheucticus ludovicianus	Rose-breasted Grosbeak	G5/S4		
Pheucticus melanocephalus	Black-headed Grosbeak	G5/S4		
Spiza Americana	Dickcissel	G5/S4		
Cathartidae				
Cathartes aura	Turkey Vulture	G5/S5		
Coragyps atratus	Black Vulture	G5/S5		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Certhiidae				
Certhia Americana	Brown Creeper	G5/S4		
Charadriidae				
Charadrius alexandrius	Snowy Plover	G4/S3		
Charadrius melodus	Piping Plover	G3/S2	T	T
Charadrius montanus	Mountain Plover	G2/S2		
Charadrius semipalmatus	Semipalmated Plover	G5/S4		
Charadrius vociferous	Killdeer	G5/S5		
Pluvialis dominicus	American Golden-Plover	G5/S3		
Pluvialis squatarola	Black-bellied Plover	G5/S4		
Ciconiidae				
Mycteria Americana	Wood Stork	G4/SH	T	
Columbidae				
Columba livia	Rock Dove	G5/Exotic		
Columbina inca	Inca Dove	G5/S5		
Columbina passerine	Common Ground-Dove	G5/S4		
Columbina talpacoti	Ruddy Ground-Dove	G5/No TX Record		
Leptotila verreauxi	White-tipped Dove	G5/S4		
Streptopelia decaucto	Eurasian Collared-Dove	G5/Exotic		
Zenaida asiatica	White-winged Dove	G5/S5		
Zenaida macroura	Mourning Dove	G5/S5		
Corvidae				
Corvus cryptoleucus	Chihuahuan Raven	G5/S4		
Cyanocitta cristata	Blue Jay	G5/S5		
Cyanocorax yncas	Green Jay	G5/No TX Record		
Cuculidae				
Coccyzus Americanus	Yellow-billed Cuckoo	G5/S4		
Coccyzus erythrophthalmus	Black-billed Cuckoo	G5/S3		
Crotophaga sulcirostris	Groove-billed Ani	G5/S4		
Geococcyx Californianus	Greater Roadrunner	G5/S4		
Emberizidae				
Aimophila botterii	Botteri's Sparrow	G4/S3		
Aimophila cassinii	Cassin's Sparrow	G5/S4		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Aimophila ruficeps	Rufous-crowned Sparrow	G5/S4		
Ammodramus bairdi	Baird's Sparrow	G4/S2		
Ammodramus leconteii	Le Conte's Sparrow	G4		
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	G5/No TX Record		
Ammodramus savannarum	Grasshopper Sparrow	G5/S3		
Amphispiza bilineata	Black-throated Sparrow	G5/S4		
Arremonops rufivirgatus	Olive Sparrow	G5/S4		
Calamospiza melanocorys	Lark Bunting	G5/S4		
Calcarius ornatus	Chestnut-collared Longspur	G5/S3		
Chondestes grammacus	Lark Sparrow	G5/S4		
Junco hyemalis	Dark-eyed Junco	G5/S5		
Junco phaeonotus	Yellow-eyed Junco	G5		
Melospiza Georgiana	Swamp Sparrow	G5/S4		
Melospiza lincolnii	Lincoln's Sparrow	G5/S5		
Melospiza melodia	Song Sparrow	G5/S5		
Passerculus sandwichensis	Savannah Sparrow	G5/S4		
Passerella iliaca	Fox Sparrow	G5		
Pipilo arcticus	Spotted Towhee	No NS Record		
Pipilo chlorurus	Green-tailed Towhee	G5/S4		
Pipilo erythrophthalmus	Eastern Towhee	G5/S2		
Pipilo fuscus	Canyon Towhee	G5		
Plectrophenax nivalis	Snow Bunting	G5/No TX Record		
Pooecetes gramineus	Vesper Sparrow	G5/S5		
Spizella arborea	American Tree Sparrow	G5/No TX Record		
Spizella atrogularis	Black-chinned Sparrow	G5		
Spizella breweri	Brewer's Sparrow	G5/S4		
Spizella pallida	Clay-colored Sparrow	G5/S4		
Spizella passerine	Chipping Sparrow	G5/S4		
Spizella pusilla	Field Sparrow	G5/S5		
Zonotrichia albicollis	White-throated Sparrow	G5		
Zonotrichia atricapilla	Golden-crowned Sparrow	G5		
Zonotrichia leucophrys	White-crowned Sparrow	G5/S5		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Zonotrichia querula	Harris's Sparrow	G5/S4		
Falconidae				
Caracara plancus	Crested Caracara	G5/S4		
Falco columbarius	Merlin	G5/No NS Record		
Falco femoralis	Aplomado Falcon	G4/S1	E	E
Falco mexicanus	Prairie Falcon	G5/S3		
Falco peregrinus	Peregrine Falcon	G4/S3	E, T	
Falco sparverius	American Kestrel	G5/S4		
Fringillidae				
Carduelis flammea	Common Redpoll	G5/No TX Record		
Carduelis pinus	Pine Siskin	G5/S2		
Carduelis psaltria	Lesser Goldfinch	G5/S5		
Carduelis tristis	American Goldfinch	G5/S2		
Carpodacus mexicanus	House Finch	G5/S5		
Carpodacus purpureus	Purple Finch	G5/S4		
Loxia curvirostra	Red Crossbill	G5/S3		
Gaviidae				
Gavia adamsii	Yellow-billed Loon	G4/No Tx Record		
Gavia immer	Common Loon	G5/No Tx Record		
Gavia pacifica	Pacific Loon	G5/No Tx Record		
Gruidae				
Grus Americana	Whooping Crane	G1/S1	E	E
Grus Canadensis	Sandhill Crane	G5/S5		
Hirundinidae				
Hirundo rustica	Barn Swallow	G5/S5		
Petrochelidon fulva	Cave Swallow	G5/S4		
Petrochelidon pyrrhonota	Cliff Swallow	G5/S4		
Progne subis	Purple Martin	G5/S5		
Riparia riparia	Bank Swallow	G5/S2		
Stelgidopteryx serripennis	Northern Rough-winged Swallow	G5		
Tachycineta bicolor	Tree Swallow	G5/S3		
Tachycineta thalassina	Violet-green Swallow	G5/S4		
Icteridae				
Agelaius phoeniceus	Red-winged Blackbird	G5/S5		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Dolichonyx oryzivorus	Bobolink	G5/S3		
Euphagus carolinus	Rusty Blackbird	G4/S3		
Euphagus cyanocephalus	Brewer's Blackbird	G5/S5		
Icterus bullockii	Bullock's Oriole	G5/S4		
Icterus cucullatus	Hooded Oriole	G5/S4		
Icterus galbula	Baltimore Oriole	G5/S4		
Icterus graduacauda	Audubon's Oriole	G5/S4		
Icterus gularis	Altamira Oriole	G5/S3		
Icterus parisorum	Scott's Oriole	G5/S3		
Icterus spurious	Orchard Oriole	G5/S4		
Molothrus aeneus	Bronzed Cowbird	G5/S5		
Molothrus ater	Brown-headed Cowbird	G5/S5		
Quiscalus mexicanus	Great-tailed Grackle	G5/S5		
Quiscalus quiscula	Common Grackle	G5/S5		
Sturnella magna	Eastern Meadowlark	G5/S5		
Sturnella neglecta	Western Meadowlark	G5/S5		
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	G5/S3		
Jacanidae				
Jacana spinosa	Northern Jacana	No NS Record		
Laniidae				
Lanius ludovicianus	Loggerhead Shrike	G4/S4		
Laridae				
Chlidonias niger	Black Tern	G4/S3		
Larus argentatus	Herring Gull	G5/S5		
Larus atricilla	Laughing Gull	G5/S5		
Larus Californicus	California Gull	G5/No TX Record		
Larus Delawarensis	Ring-billed Gull	G5/S5		
Larus fuscus	Lesser Black-backed Gull	G5/No TX Record		
Larus hyperboreus	Glaucous Gull	G5/No TX Record		
Larus occidentalis	Western Gull	G5/No TX Record		
Larus Philadelphia	Bonaparte's Gull	G5/S4		
Larus pipixcan	Franklin's Gull	G4G5/S2		
Larus thayeri	Thayer's Gull	G5/No TX Record		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Rissa tridactyla	Black-legged Kittiwake	G5/No TX Record		
Rynchops niger	Black Skimmer	G5/S4		
Stercorarius longicaudus	Long-tailed Jaeger	G5/No TX Record		
Stercorarius parasiticus	Parasitic Jaeger	G5/No TX Record		
Sterna antillarum	Interior Least Tern	No NS Record		E
Sterna caspia	Caspian Tern	No NS Record		
Sterna forsteri	Forster's Tern	G5/S5		
Sterna fuscata	Sooty Tern	No NS Record	T	
Sterna hirundo	Common Tern	G5/S1		
Xema sabini	Sabine's Gull	G5/No TX Record		
Mimidae				
Dumetella carolinensis	Gray Catbird	G5/S4		
Mimus polyglottos	Northern Mockingbird	G5/S5		
Oreoscoptes montanus	Sage Thrasher	G5/No NS Record		
Toxostoma curvirostre	Curve-billed Thrasher	G5/S4		
Toxostoma longirostre	Long-billed Thrasher	G5/S4		
Toxostoma rufum	Brown Thrasher	G5/S4		
Motacillidae				
Anthus rubescens	American Pipit	G5/S4		
Anthus spragueii	Sprague's Pipit	G4/No TX Record		
Odontophoridae				
Callipepla squamata	Scaled Quail	G5/S4		
Colinus virginianus	Northern Bobwhite	G5/S4		
Paridae				
Baeolophus atricristatus	Black-crested Titmouse	G5/S5		
Parus (Poecile) carolinensis	Carolina Chickadee	G5/S5		
Parulidae				
Basileuterus rufifrons	Rufous-capped Warbler	No NS Record		
Cardellina rubrifrons	Red-faced Warbler	G5/No TX Record		
Dendroica caerulescens	Black-throated Blue Warbler	G5/S3		
Dendroica castanea	Bay-breasted Warbler	G5/S4		
Dendroica cerulean	Cerulean Warbler	G4/SH		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Dendroica chrysoparia	Golden-cheeked Warbler	G2/S2	E	E
Dendroica discolor	Prairie Warbler	G5/S3		
Dendroica dominica	Yellow-throated Warbler	G5/S4		
Dendroica fusca	Blackburnian Warbler	G5/S3		
Dendroica magnolia	Magnolia Warbler	G5/S4		
Dendroica nigrescens	Black-throated Gray Warbler	G5/SH		
Dendroica occidentalis	Hermit Warbler	G4G5/S3		
Dendroica palmarum	Palm Warbler	G5/S3		
Dendroica pensylvanica	Chestnut-sided Warbler	G5/No TX Record		
Dendroica petechia	Yellow Warbler	G5/S2		
Dendroica pinus	Pine Warbler	G5/S5		
Dendroica striata	Blackpoll Warbler	G5/S3		
Dendroica tigrina	Cape May Warbler	G5/S2		
Dendroica townsendi	Townsend's Warbler	G5/S4		
Dendroica virens	Black-throated Green Warbler	G5/S4		
Geothlypis trichas	Common Yellowthroat	G5/S5		
Helmitheros vermivorus	Worm-eating Warbler	G5/S3		
Icteria virens	Yellow-breasted Chat	G5/S5		
Limnothlypis swainsonii	Swainson's Warbler	G4/S3		
Mniotilta varia	Black-and-white Warbler	G5/S4		
Myioborus miniatus	Slate-throated Redstart	No NS Record		
Myioborus pictus	Painted Redstart	G5/S3		
Oporornis formosus	Kentucky Warbler	G5/S3		
Oporornis Philadelphia	Mourning Warbler	G5/S4		
Oporornis tolmiei	MacGillivray's Warbler	G5/S4		
Parula Americana	Northern Parula	G5/S4		
Parula pitiayumi	Tropical Parula	G5/S3	T	
Protonotaria citrea	Prothonotary Warbler	G5/S3		
Seiurus aurocapillus	Ovenbird	G5/S4		
Seiurus motacilla	Louisiana Waterthrush	G5/S3		
Seiurus noveboracensis	Northern Waterthrush	G5/S4		
Setophaga ruticilla	American Redstart	G5/S2		
Vermivora celata	Orange-crowned Warbler	G5/S4		
Vermivora chrysoptera	Golden-winged Warbler	G4/S3		
Vermivora crissalis	Colima Warbler	G3G4/S3		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Vermivora peregrine	Tennessee Warbler	G5/S4		
Vermivora pinus	Blue-winged Warbler	G5/S4		
Vermivora ruficapilla	Nashville Warbler	G5/S5		
Vermivora virginiae	Virginia's Warbler	G5/S3		
Wilsonia Canadensis	Canada Warbler	G5/S4		
Wilsonia citrine	Hooded Warbler	G5/S5		
Wilsonia pusilla	Wilson's Warbler	G5/S4		
Passeridae				
Passer domesticus	House Sparrow	G5/Exotic		
Pelecanidae				
Pelecanus erythrorhynchos	American White Pelican	G3/S2		
Pelecanus occidentalis	Brown Pelican	G4/S3	E	E
Phalacrocoracidae				
Phalacrocorax auritus	Double-crested Cormorant	G5/S3		
Phalacrocorax brasilianus	Neotropic Cormorant	G5/S4		
Phasianidae				
Meleagris gallopavo	Wild Turkey	G5/S5		
Picidae				
Colaptes auratus	Northern Flicker	G5/S3		
Melanerpes aurifrons	Golden-fronted Woodpecker	G5/S5		
Melanerpes erythrocephalus	Red-headed Woodpecker	G5/S3		
Melanerpes formicivorus	Acorn Woodpecker	G5/S4		
Picoides pubescens	Downy Woodpecker	G5/S4		
Picoides scalaris	Ladder-backed Woodpecker	G5/S5		
Sphyrapicus nuchalis	Red-naped Sapsucker	G5/S3		
Sphyrapicus varius	Yellow-bellied Sapsucker	G5/No TX Record		
Podicipedidae				
Aechmophorus occidentalis	Western Grebe	G5/S3		
Podiceps auritus	Horned Grebe	G5/No Tx Record		
Podiceps nigricollis	Eared Grebe	G5/S3		
Podilymbus podiceps	Pied-billed Grebe	G5/S5		
Tachybaptus dominicus	Least Grebe	G5/S3		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Ptilogonatidae				
Phainopepla nitens	Phainopepla	G5/S4		
Ptilogonys cinereus	Gray Silky-flycatcher	No NS Record		
Rallidae				
Coturnicops noveboracensis	Yellow Rail	G4/No TX Record		
Fulica Americana	American Coot	G5/S4		
Gallinula chloropus	Common Moorhen	G5/S4		
Porphyrio martinica	Purple Gallinule	G5/S4		
Porzana Carolina	Sora	G5/S3		
Rallus elegans	King Rail	G4/S3		
Rallus limicola	Virginia Rail	G5/S3		
Recurvirostridae				
Himantopus mexicanus	Black-necked Stilt	G5/S5		
Recurvirostra Americana	American Avocet	G5/S4		
Regulidae				
Regulus calendula	Ruby-crowned Kinglet	G5/S5		
Regulus satrapa	Golden-crowned Kinglet	G5/No TX Record		
Remizidae				
Auriparus flaviceps	Verdin	G5/S4		
Scolopacidae				
Actitis macularia	Spotted Sandpiper	G5/S3		
Arenaria interpres	Ruddy Turnstone	G5/S5		
Bartramia longicauda	Upland Sandpiper	G5/S3		
Calidris alba	Sanderling	G5/S5		
Calidris alpine	Dunlin	G5/S4		
Calidris bairdii	Baird's Sandpiper	G5/S3		
Calidris canutus	Red Knot	G4/No TX Record		
Calidris fuscicollis	White-rumped Sandpiper	G5/S3		
Calidris himantopus	Stilt Sandpiper	G5/S3		
Calidris mauri	Western Sandpiper	G5/S5		
Calidris melanotos	Pectoral Sandpiper	G5/S4		
Calidris minutilla	Least Sandpiper	G5/S5		
Calidris pusilla	Semipalmated Sandpiper	G5/S5		
Catoptrophorus semipalmatus	Willet	G5/S5		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Limnodromus griseus	Short-billed Dowitcher	G5/S3		
Limnodromus scolopaceus	Long-billed Dowitcher	G5/S4		
Limosa fedoa	Marbled Godwit	G5/S4		
Limosa haemastica	Hudsonian Godwit	G4/S2		
Numenius Americanus	Long-billed Curlew	G5/S3		
Numenius borealis	Eskimo Curlew	GH/SH	E	E
Numenius phaeopus	Whimbrel	G5/S4		
Phalaropus fulicarius	Red Phalarope	G5/No TX Record		
Phalaropus tricolor	Wilson's Phalarope	G5/S3		
Phalarupus lobatus	Red-necked Phalarope	G4G5/No TX Record		
Philomachus pugnax	Ruff	G5/No TX Record		
Scolopax minor	American Woodcock	G5/S2		
Tringa flavipes	Lesser Yellowlegs	G5/S5		
Tringa melanoleuca	Greater Yellowlegs	G5/S5		
Tringa solitaria	Solitary Sandpiper	G5/S5		
Sittidae				
Sitta canadensis	Red-breasted Nutchatch	G5/S2		
Strigidae				
Asio flammeus	Short-eared Owl	G5/No TX Record		
Asio otus	Long-eared Owl	G5/S2		
Athene cunicularia	Burrowing Owl	G4/S3		
Bubo virginianus	Great Horned Owl	G5/S5		
Glaucidium brasilianum	Ferruginous Pygmy-Owl	G5/S3		
Micrathene whitneyi	Elf Owl	G5/S4		
Otus asio	Eastern Screech-Owl	G5/S2		
Otus flammeolus	Flammulated Owl	G4/S3		
Strix varia	Barred Owl	G5/S5		
Sturnidae				
Sturnus vulgaris	European Starling	G5/Exotic		
Sylviidae				
Polioptila caerulea	Blue-gray Gnatcatcher	G5/S3		
Polioptila melanura	Black-tailed Gnatcatcher	G5/S4		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Thraupidae				
Piranga bidentata	Flame-colored Tanager	No NS Record		
Piranga flava	Hepatic Tanager	G5/S4		
Piranga ludoviciana	Western Tanager	G5/S4		
Piranga olivacea	Scarlet Tanager	G5/S4		
Piranga rubra	Summer Tanager	G5/S5		
Threskiornithidae				
Eudocimus albus	White Ibis	G5/S4		
Platalea ajaja	Roseate Spoonbill	G5/S4		
Plegadis chihi	White-faced Ibis	G5/S4	T	
Plegadis falcinellus	Glossy Ibis	G5/S3		
Trochilidae				
Amazilia violiceps	Violet-crowned Hummingbird	G5/No TX Record		
Amazilia yucatanensis	Buff-bellied Hummingbird	G4/S3		
Archilochus colubris	Ruby-throated Hummingbird	G5/S4		
Archilocus alexandri	Black-chinned Hummingbird	G5/S5		
Calypte anna	Anna's Hummingbird	G5/No TX Record		
Cynanthus latirostris	Broad-billed Hummingbird	G4/SH		
Hylocharis leucotis	White-eared Hummingbird	G5/No TX Record		
Lampornis clemenciae	Blue-throated Hummingbird	G5/S3		
Sealsphorus rufus	Rufous Hummingbird	G5/No TX Record		
Selasphorus platycercus	Broad-tailed Hummingbird	G5/S3		
Troglodytidae				
Campylorhynchus brunneicapillus	Cactus Wren	G5/S4		
Cistothorus palustris	Marsh Wren	G5/S4		
Cistothorus platensis	Sedge Wren	G5/S4		
Salpinctes obsoletus	Rock Wren	G5/S5		
Thryomanes bewickii	Bewick's Wren	G5/S5		
Thryothorus ludovicianus	Carolina Wren	G5/S5		
Troglodytes aedon	House Wren	G5/S2		
Troglodytes troglodytes	Winter Wren	G5/No TX Record		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Turdidae				
Catharus fuscescens	Veery	G5/No TX Record		
Catharus guttatus	Hermit Thrush	G5/S4		
Catharus minimus	Gray-cheeked Thrush	G5/S4		
Catharus ustulatus	Swainson's Thrush	G5/S4		
Hylocichla mustelina	Wood Thrush	G5/S4		
Ixoreus naevius	Varied Thrush	G5/No TX Record		
Myadestes townsendi	Townsend's Solitaire	G5/No TX Record		
Sialia currucoides	Mountain Bluebird	G5/S3		
Sialia sialis	Eastern Bluebird	G5/S5		
Turdus migratorius	American Robin	G5/S4		
Turdus rufopalliatus	Rufous-backed Robin	G5/No TX Record		
Tyrannidae				
Camptostoma imberbe	Northern Beardless-Tyrannulet	G5/S3	T	
Contopus cooperi	Olive-sided Flycatcher	G4/S3		
Contopus pertinax	Greater Pewee	G5/No TX Record		
Contopus sordidulus	Western Wood-Pewee	G5/S4		
Contopus virens	Eastern Wood-Pewee	G5/S4		
Empidonax flaviventris	Yellow-bellied Flycatcher	G5/No TX Record		
Empidonax hammondii	Hammond's Flycatcher	G5/S3		
Empidonax minimus	Least Flycatcher	G5/S5		
Empidonax traillii	Willow Flycatcher	G5/S1		
Empidonax virescens	Acadian Flycatcher	G5/S4		
Legatus leucophaius	Piratic Flycatcher	No NS Record		
Myiarchus cineruscens	Ash-throated Flycatcher	G5/S3		
Myiarchus crinitus	Great Crested Flycatcher	G5/S4		
Myiarchus tuberculifer lawrencei	Dusky-capped Flycatcher	G5/No TX Record		
Myiarchus tyrannulus	Brown-crested Flycatcher	G5/S4		
Myiodynastes luteiventris	Sulphur-bellied Flycatcher	G5/No TX Record		
Pachyramphus aglaiae	Rose-throated Becard	G4G5/No Tx Record	T	
Pitangus sulphuratus	Great Kiskadee	G5/S4		
Pyrocephalus rubinus	Vermilion Flycatcher	G5/S4		

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Sayornis nigricans	Black Phoebe	G5/S4		
Sayornis phoebe	Eastern Phoebe	G5/S4		
Sayornis saya	Say's Phoebe	G5/S4		
Tyrannus couchii	Couch's Kingbird	G5		
Tyrannus forficatus	Scissor-tailed Flycatcher	G5/S3		
Tyrannus melancholicus	Tropical Kingbird	G5/S1		
Tyrannus tyrannus	Eastern Kingbird	G5/S4		
Tyrannus verticalis	Western Kingbird	G5/S3		
Tyrannus vociferans	Cassin's Kingbird	G5/S3		
Vireonidae				
Vireo atricapillus	Black-capped Vireo	G2G3/S2	E	E
Vireo bellii	Bell's Vireo	G5/S3		
Vireo cassini	Cassin's Vireo	G5/No TX Record		
Vireo flavifrons	Yellow-throated Vireo	G5/S4		
Vireo flavoviridis	Yellow-green Vireo	G5/S2		
Vireo gilvus	Warbling Vireo	G5/S3		
Vireo griseus	White-eyed Vireo	G5/S5		
Vireo olivaceus	Red-eyed Vireo	G5/S5		
Vireo philadelphicus	Philadelphia Vireo	G5/S4		
Vireo solitarius	Blue-headed Vireo	G5/No TX Record		

Mammals of the Del Rio Sector Area

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Order Didelphimorphia					
Family Didelphidae (opossums)					
Didelphis virginiana	Virginia Opossum	G5			V,M
Order Xenarthra					
Family Dasypodidae (armadillos)					
Dasypus novemcinctus	Nine-banded Armadillo	G5			V,M
Order Insectivora					
Family Soricidae (shrews)					
Cryptotis parva	Least Shrew	G5			V,M
Notiosorex crawfordi	Desert Shrew	G5			V,M
Order Chiroptera					
Family Mormoopidae (mormoopid bats)					
Mormoops megalophylla	Ghost-faced Bat	G4			V,M
Family Phyllostomidae (leaf-nosed bats)					
Diphylla ecaudata	Hairy-legged Vampire	uk			V
Family Vespertilionidae (vespertilionid bats)					
Plecotus townsendii	Townsend's Big-eared Bat	G4			V
Antrozous pallidus	Pallid Bat	G5			V,M
Lasionycteris noctivagans	Silver-haired Bat	G5			V,M
Lasiurus borealis	Eastern Red Bat	G5			V,M
Lasiurus cinereus	Hoary Bat	G5			V,M
Myotis californicus	California Myotis	G5			V,M
Myotis yumanensis	Yuma Myotis	G5			V,M
Nycticeius humeralis	Evening Bat	G5			V,M
Perimyotis subflavus	Eastern Pipistrelle	G5			V,M
Pipistrellus hesperus	Western Pipistrelle	G5			V,M
Family Molossidae (free-tailed bats)					
Eumops perotis	Western Mastiff Bat	G5			V
Nyctinomops macrotis	Big Free-tailed Bat	G5			V,M
Tadarida brasiliensis	Brazilian Free-tailed Bat	G5			V,M
Order Lagomorpha					
Family Leporidae (hares and rabbits)					
Lepus californicus	Black-tailed Jackrabbit	G5			V,M

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Sylvilagus audubonii	Desert Cottontail	G5			V,M
Sylvilagus floridanus	Eastern Cottontail	G5			V,M
Order Rodentia					
Family Sciuridae (squirrels and allies)					
Ammospermophilus interpres	Texas Antelope Squirrel	G4G5			V
Cynomys ludovicianus	Black-tailed Prairie Dog	G4			V
Sciurus niger	Eastern Fox Squirrel	G5			V,M
Spermophilus mexicanus	Mexican Ground Squirrel	G5			V,M
Spermophilus spilosoma	Spotted Ground Squirrel	G5			V,M
Spermophilus variegatus	Rock Squirrel	G5			V
Family Geomyidae (pocket gophers)					
Cratogeomys castanops	Yellow-faced Pocket Gopher	G5			V,M
Geomys personatus	Texas Pocket Gopher	G4			V,M
Thomomys bottae	Botta's Pocket Gopher	G5			V
Family Heteromyidae (pocket mice and kangaroo rats)					
Chaetodipus hispidus	Hispid Pocket Mouse	G5			V,M
Chaetodipus nelsoni	Nelson's Pocket Mouse	G5			V,M
Chaetodipus penicillatus	Desert Pocket Mouse	G5			V
Dipodomys compactus	Gulf Coast Kangaroo Rat	G4			M
Dipodomys merriami	Merriam's Kangaroo Rat	G5			V,M
Dipodomys ordii	Ord's Kangaroo Rat	G5			V,M
Perognathus merriami	Merriam's Pocket Mouse	G5			V,M
Family Muridae (mice and rats)					
Baiomys taylori	Northern Pygmy Mouse	G4G5			V,M
Mus musculus	house mouse	G5			V,M
Neotoma leucodon	White-toothed Woodrat	G5			V
Neotoma micropus	Southern Plains Woodrat	G5			V,M
Ondatra zibethicus	Common Muskrat	G5			V
Onychomys arenicola	Mearns' Grasshopper Mouse	G4G5			V
Onychomys leucogaster	Northern Grasshopper Mouse	G5			V,M
Peromyscus attwateri	Texas Mouse	G5			V

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Peromyscus eremicus	Cactus Mouse	G5			V,M
Peromyscus leucopus	White-footed Mouse	G5			V,M
Peromyscus maniculatus	Deer Mouse	G5			V,M
Peromyscus pectoralis	White-ankled Mouse	G5			V,M
Rattus norvegicus	Norway Rat	G5			V,M
Rattus rattus	Roof rat	G5			V,M
Reithrodontomys fulvescens	Fulvous Harvest Mouse	G5			V,M
Sigmodon hispidus	Hispid Cotton Rat	G5			V,M
Family Erethizontidae (New World porcupines)					
Erethizon dorsatum	Porcupine	G5			V,M
Family Castoridae (beavers)					
Castor canadensis	American Beaver	G5			V,M
Family Myocastoridae (myocastorids)					
Myocastor coypus	Nutria	G5			V,M
Order Carnivora					
Family Canidae (canids)					
Canis latrans	Coyote	G5			V,M
Urocyon cinereoargenteus	Common Gray Fox	G5			V,M
Vulpes velox	Swift or Kit Fox	G3			V
Vulpes vulpes	Red Fox	G5			V
Family Ursidae (bears)					
Ursus americanus	Black Bear	G5			UK
Family Procyonidae (procyonids)					
Bassariscus astutus	Ringtail	G5			V,M
Nasua narica	White-nosed Coati	G5			V,M
Procyon lotor	Common Raccoon	G5			V,M
Family Mustelidae (mustelids)					
Conepatus mesoleucus	Common Hog-nosed Skunk	uk			V,M
Mephitis mephitis	Striped Skunk	G5			V,M
Mustela frenata	Long-tailed Weasel	G5			V,M
Spilogale gracilis	Western Spotted Skunk	G5			V,M
Taxidea taxus	American Badger	G5			V,M
Family Felidae (cats)					
Felis pardalis	Ocelot	G4		LE	V,M
Lynx rufus	Bobcat	G5			V,M
Puma concolor	Mountain Lion	G5			V,M

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Order Artiodactyla					
Family Suidae (pigs)					
Sus scrofa	feral hog	G5			V,M
Family Dicotylidae (peccaries)					
Pecari tajacu	Collared Peccary	G5			V,M
Family Cervidae (cervids)					
Axis axis	Axis Deer	G4			V,M
Cervus nippon	Sika Deer	G4			V,M
Dama dama	Fallow deer	G5			V,M
Odocoileus virginianus	White-tailed Deer	G5			V,M
Family Bovidae (bovids)					
Ammotragus lervia	barbary sheep	G5			V,M
Antilope cervicapra	blackbrush antilope	G3G4			V,M
Boselaphus tragocamelus	nilgai	G3G4			V,M

Amphibians of the Del Rio Sector Area

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Salamanders					
Ambystomatidae					
Ambystoma tigrinum	Tiger Salamander	G5			V
Plethodontidae					
Eurycea neotenes	Texas Salamander	G1			V
Sirenidae					
Siren intermedia	Lesser Siren	G5			M
Siren sp. 1	South Texas siren (Large form)	No record	T		M
Toads					
Bufonidae					
Bufo debilis	Green Toad	G5			M,V
Bufo fowleri	Fowler's Toad	G5			M,V
Bufo punctatus	Red-spotted Toad	G5			M,V
Bufo valliceps	Gulf Coast Toad	No record			M,V
Microhylidae					
Gastrophryne olivacea	Great Plains Narrowmouth Toad	G5			M,V
Frogs					
Hylidae					
Acris crepitans	Northern Cricket Frog	G5			M,V
Leptodactylidae					
Eleutherodactylus augusti	Barking Frog	G5			V
Eleutherodactylus marnockii	Cliff Chirping Frog	G5			V
Ranidae					
Rana berlandieri	Rio Grande Leopard Frog	G5			M,V
Rana catesbeiana	Bullfrog	G5			M,V
Scaphiopodidae					
Scaphiopus couchii	Couch's Spadefoot	G5			M,V
Spea multiplicata	New Mexico Spadefoot	G5			V

Reptiles of the Del Rio Sector Area

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Turtles					
Emydidae					
Pseudemys gorzugi	Rio Grande River Cooter	G3G4			V
Terrapene ornata	Western Box Turtle	G5			V
Trachemys scripta	Slider	G5			M,V
Kinosternidae					
Kinosternon flavescens	Yellow Mud Turtle	G5			M,V
Testudinidae					
Gopherus berlandieri	Texas Tortoise	G4	T		M,V
Trionychidae					
Apalone mutica	Smooth Softshell	G5			V
Apalone spinifera	Spiny Softshell	G5			M,V
Alligators					
Alligatoridae					
Alligator mississippiensis	American Alligator	G5	SAT		M
Lizards					
Anguidae					
Gerrhonotus infernalis	Texas Alligator Lizard	G4			V
Crotaphytidae					
Crotaphytus collaris	Eastern Collared Lizard	G5			M,V
Crotaphytus reticulatus	Reticulate Collared Lizard	G3	T		M
Gekkonidae					
Coleonyx brevis	Texas Banded Gecko	G5			V
Phrynosomatidae					
Cophosaurus texanus	Greater Earless Lizard	G5			M,V
Holbrookia lacerata	Spot-tailed Earless Lizard	G3G4			M,V
Holbrookia propinqua	Keeled Earless Lizard	G4			M
Phrynosoma cornutum	Texas Horned Lizard	G4G5	T		M,V
Phrynosoma modestum	Round-tailed Horned Lizard	G5			V
Sceloporus serrifer	Blue Spiny Lizard	G5			M
Sceloporus merriami	Canyon Lizard	G4			V
Sceloporus olivaceus	Texas Spiny Lizard	G5			M,V
Sceloporus poinsettii	Crevice Spiny Lizard	G5			V
Sceloporus undulatus	Fence/prairie/plateau Lizard	G5			M,V
Sceloporus variabilis	Rosebelly Lizard	G5			M
Urosaurus ornatus	Tree Lizard	G5			M,V

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Uta stansburiana	Side-blotched Lizard	G5			V
Anolis carolinensis	Green Anole	G5			V
Scincidae					
Eumeces obsoletus	Great Plains Skink	G5			M,V
Eumeces tetragrammus	Four-lined Skink	G5			M,V
Scincella lateralis	Ground Skink	G5			V
Snakes					
Colubridae					
Arizona elegans	Glossy Snake	G5			M,V
Coluber constrictor	Racer	G5			V
Diadophis punctatus	Ring-necked Snake	G5			M,V
Drymarchon melanurus erebennus	Texas Indigo Snake	G5T4	T		M,V
Elaphe bairdi	Baird's Ratsnake	G4			V
Elaphe guttata	Red Cornsnake	G5			M,V
Gyalopion canum	Chihuahuan Hook-nosed Snake	G5			V
Heterodon nasicus	Western Hog-nosed Snake	G5			M,V
Hypsiglena torquata	Nightsnake	G5			M,V
Lampropeltis alterna	Gray-banded Kingsnake	G5			V
Lampropeltis getula	Common Kingsnake	G5			M,V
Lampropeltis triangulum	Milksnake	G5			M,V
Masticophis flagellum	Coachwhip	G5			M,V
Masticophis schotti	Schott's Whipsnake	G5			M
Masticophis taeniatus	Striped Whipsnake	G5			V
Nerodia erythrogaster	Plain-bellied Watersnake	G5			V
Nerodia rhombifer	Diamond-backed Watersnake	G5			M,V
Opheodrys aestivus	Rough Greensnake	G5			M,V
Pituophis catenifer	Gophersnake	G5			M,V
Rhinocheilus lecontei	Long-nosed Snake	G5			M,V
Salvadora grahamiae	Eastern Patch-nosed Snake	G5			M,V
Sonora semiannulata	Groundsnake	G5			M,V
Tantilla cucullata	Trans-Pecos Black-headed Snake	G3	T		V
Tantilla gracilis	Flat-headed Snake	G5			M,V
Tantilla hobartsmithi	Smith's Black-headed Snake	G5			M,V
Tantilla nigriceps	Plains Black-headed Snake	G5			M,V
Thamnophis cyrtopsis	Black-necked Gartersnake	G5			V
Thamnophis marcianus	Checkered Gartersnake	G5			M,V

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Thamnophis proximus	Western Ribbonsnake	G5			M,V
Elapidae					
Micrurus fulvius	Harlequin Coralsnake	G5			M,V
Leptotyphlopidae					
Leptotyphlops dulcis	Texas Threadsnake	G5			M,V
Leptotyphlops humilis	Western Threadsnake	G5			V
Teiidae					
Aspidoscelis gularis	Texas Spotted Whiptail	G5			M,V
Aspidoscelis inornata	Little Striped Whiptail	G5			V
Aspidoscelis laredoensis	Laredo Striped Whiptail	G4			M,V
Aspidoscelis tigris marmorata	Western Marbled Whiptail	G5			V
Aspidoscelis sexlineata	Six-lined Racerunner	G5			M,V
Aspidoscelis tesselata	Common Checkered Whiptail	G5			V
Bogertophis subocularis	Trans-pecos Snake	G4G5			V
Viperidae					
Agkistrodon contortrix	Copperhead	G5			V
Agkistrodon piscivorus	Cottonmouth	G5			M
Crotalus atrox	Western Diamond-backed Rattlesnake	G5			M,V
Crotalus lepidus	Rock Rattlesnake	G5			M,V
Crotalus molossus	Black-tailed Rattlesnake	G5			V

Butterflies of the Del Rio Sector Area

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Skippers (Hesperiidae)					
Grass Skippers (Hesperiinae)					
Amblyscirtes cassus	Cassus Roadside-skipper	G5			V
Amblyscirtes eos	Dotted Roadside-skipper	G5			V
Amblyscirtes nysa	Nysa Roadside-skipper	G5			M,V
Ancyloxypha arene	Tropical Least Skipper	G5			M,V
Ancyloxypha numitor	Common Least Skipper	G5			V
Atalopedes campestris	Sachem	G5			M,V
Copaeodes aurantiaca	Orange Skipperling	G5			M,V
Copaeodes minima	Southern Skipperling	G5			M,V
Hesperia viridis	Green Skipper	G5			M,V
Hylephila phyleus	Fiery Skipper	G5			M,V
Lerema accius	Clouded Skipper	G5			M,V
Lerodea eufala	Eufala Skipper	G5			M,V
Nastra julia	Julia's Skipper	G5			M,V
Panoquina ocola	Ocola Skipper	G5			V
Polites vibex	Whirlabout	G5			M,V
Giant-Skippers (Megathyminae)					
Agathymus mariae	Mary's Giant-skipper	G3G4			V
Agathymus remingtoni valverdiensis	Coahuila Giant Skipper	G4T2T3			V
Megathymus yuccae	Yucca Giant-skipper	G5			V
Spread-wing Skippers (Pyrginae)					
Achalarus toxeus	Coyote Cloudywing	G5			V
Astraptes fulgerator	Two-barred Flasher	No record			V
Celotes nessus	Common Streaky-skipper	G5			M,V
Cogia outis	Outis Skipper	G3G4			V
Erynnis funeralis	Funereal Duskywing	G5			V
Erynnis juvenalis	Juvenal's Duskywing	G5			V
Erynnis meridianus	Meridian Duskywing	G5			M,V
Gesta invisus	False Duskywing	G5			M,V
Pholisora catullus	Common Sootywing	G5			M,V
Pyrgus albescens	White Checkered-skipper	G5			M,V
Pyrgus philetas	Desert Checkered-skipper	G5			M,V
Staphylus ceos	Golden-headed Scallopwing	G5			V

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Systasea pulverulenta	Texas Powdered-skipper	G5			V
Gossamer-wing Butterflies (Lycaenidae)					
Blues (Polyommatinae)					
Brephidium exilis	Western Pygmy-blue	G5			V
Echinargus isola	Reakirt's Blue	G5			M,V
Hemiargus ceraunus	Ceraunus Blue	G5			M
Metalmarks (Riodinidae)					
Apodemia duryi	Mexican Metalmark	G3G4			V
Calephelis nemesis	Fatal Metalmark	G5			M,V
Hairstreaks (Theclinae)					
Atlides halesus	Great Purple Hairstreak	G5			V
Callophrys henrici	Henry's Elfin	G5			V
Calycopis isobeon	Dusky-blue Groundstreak	G5			M,V
Phaeostrymon alcestis	Soapberry Hairstreak	G5			M,V
Satyrium favonius	Oak Hairstreak	G4			M,V
Strymon alea	Lacey's Scrub-hairstreak	G3G4			V
Strymon istapa	Mallow Scrub-hairstreak	G5			V
Strymon melinus	Gray Hairstreak	G5			M,V
Brush-footed Butterflies (Nymphalidae)					
Emperors (Apaturinae)					
Asterocampa celtis	Hackberry Emperor	G5			M,V
Asterocampa clyton	Tawny Emperor	G5			M,V
Asterocampa leilia	Empress Leilia	G5			M,V
Leafwings (Charaxinae)					
Anaea aidea	Tropical Leafwing	No record			V
Anaea andria	Goatweed Leafwing	G5			M,V
Milkweed Butterflies (Danainae)					
Danaus gilippus	Queen	G5			M,V
Danaus plexippus	Monarch	G5		SC	M,V
Longwings (Heliconiinae)					
Agraulis vanillae	Gulf Fritillary	G5			M,V
Euptoieta claudia	Variegated Fritillary	G5			M,V
Heliconius charithonia	Zebra	G5			V
Snouts (Libytheinae)					
Libytheana carinenta	American Snout	G5			M,V
Admirals and Relatives (Limenitidinae)					
Eunica monima	Dingy Purplewing	G5			M,V
Limenitis archippus	Viceroy	G5			M,V

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status	County
Marpesia chiron	Many-banded Daggerwing	G5			V
Mestra amymone	Common Mestra	G5			M,V
True Brushfoots (Nymphalinae)					
Anartia jatrophae	White Peacock	G5			M
Anthanassa texana	Texan Crescent	G5			M,V
Chlosyne lacinia	Bordered Patch	G5			M,V
Chlosyne theona	Theona Checkerspot	G5			M,V
Nymphalis antiopa	Mourning Cloak	G5			V
Phyciodes graphica	Graphic Crescent	G5			M
Phyciodes phaon	Phaon Crescent	G5			M,V
Phyciodes picta	Painted Crescent	G5			M
Phyciodes tharos	Pearl Crescent	G5			M
Poladryas minuta	Dotted Checkerspot	G5			V
Polygonia interrogationis	Question Mark	G5			M
Texola elada	Elada Checkerspot	G5			V
Vanessa atalanta	Red Admiral	G5			M,V
Vanessa cardui	Painted Lady	G5			M,V
Vanessa virginiensis	American Lady	G5			V
Parnassians and Swallowtails (Papilionidae)					
Swallowtails (Papilioninae)					
Battus philenor	Pipevine Swallowtail	G5			M,V
Papilio cresphontes	Giant Swallowtail	G5			M,V
Papilio multicaudata	Two-tailed Swallowtail	G5			M,V
Papilio polyxenes	Black Swallowtail	G5			M,V
Papilio thoas	Thoas Swallowtail	No record			V
Whites and Sulphurs (Pieridae)					
Sulphurs (Coliadinae)					
Abaeis nicippe	Sleepy Orange	G5			M,V
Anteos clorinde	White Angled-Sulphur	No record			V
Colias eurytheme	Orange Sulphur	G5			M,V
Eurema mexicana	Mexican Yellow	G5			V
Kricogonia lyside	Lyside Sulphur	G5			M,V
Nathalis iole	Dainty Sulphur	G5			M,V
Phoebis agarithe	Large Orange Sulphur	G5			M,V
Phoebis sennae	Cloudless Sulphur	G5			M
Pyrisitia lisa	Little Yellow	G5			M,V
Zerene cesonia	Southern Dogface	G5			M,V
Whites (Pierinae)					
Pontia protodice	Checkered White	G4			V

Appendix D Tablenotes

Key:

E = Endangered

T = Threatened

SC = Special concern

SAT = Listed endangered or threatened because of similarity of appearance

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

No Record = No record found in NatureServe Database

M= Maverick County (Section M-1)

V= Val Verde County (Section M-2A)

Sources:

http://www.butterfliesandmoths.org/

http://wfscnet.tamu.edu/tcwc/Herps_online/CountyRecords.htm

http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0809.pdf

http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_1033.pdf

http://www.nsrl.ttu.edu/tmot1/Default.htm

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APPENDIX G

Biological Resources Plan

BIOLOGICAL RESOURCES PLAN

FOR

CONSTRUCTION, OPERATION, AND MAINTENANCE OF TACTICAL INFRASTRUCTURE

FOR

DEL RIO SECTOR, TEXAS

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL DEL RIO SECTOR

Prepared by

Solutions Today for a Sustainable Tomorrow

JULY 2008

Abbreviations and Acronyms

°F	Degrees Fahrenheit
BA	Biological Assessment
BMP	Best Management Practice
BRP	Biological Resources Plan
CBP	U.S. Customs and Border Protection
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
DHS	U.S. Department of Homeland Security
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GPS	Global Positioning System
INS	Immigration and Naturalization Service
km^2	square kilometer
m	meter
mph	miles per house
NEPA	National Environmental Policy Act
OBP	Office of Border Patrol
PEIS	Programmatic Environmental Impact Statement
PUPS	Pesticide Use Proposals
RVSS	Remote Visual Surveillance System
T&E	Threatened and Endangered
USBP	U.S. Border Patrol
USIBWC	U.S. Section, International Boundary and Water Commission
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

The U.S Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), U.S. Border Patrol (USBP) is planning to construct, operate, and maintain tactical infrastructure consisting of primary pedestrian fences with an aesthetic quality, supporting patrol roads, lights, and other infrastructure in two sections along the U.S./Mexico international border in Val Verde and Maverick counties, Texas. This Biological Resources Plan (BRP) addresses potential impacts on, and appropriate mitigation measures for, threatened and endangered species in the Project area.

Table ES-1 summarizes the federally listed species that are known to occur within 25 miles of the U.S./Mexico international border in Val Verde County.

Table ES-2 summarizes the federally listed species that are known to occur within 25 miles of the U.S./Mexico international border in Maverick County.

Table ES-1. Determination of Effects on Federally Listed Species in Val Verde County

Species	Listing Status	Determination
Brown pelican, *Pelecanus occidentalis*	Endangered	No effect
Black-capped vireo, *Vireo atricapilla*	Endangered	No effect
Least tern, *Sterna antillarum*	Endangered	No effect
Texas snowbells, *Styrax texana*	Endangered	No effect
Tobusch fishhook cactus, *Ancistrocactus tobuschii*	Endangered	No effect
Devils River minnow, *Dionda diabolic*	Threatened	No effect

Table ES-2. Determination of Effects on Federally Listed Species in Maverick County

Species	Listing Status	Determination
Ocelot, *Leopardus pardalis*	Endangered	Not likely to adversely affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Not likely to adversely affect

The species listed in **Tables ES-1** and **ES-2** are known to occur within 25 miles of the border in Val Verde and Maverick counties. However, based upon the information provided regarding the implementation of the Project in specific sections, no effects are anticipated for brown pelican, black-capped vireo, least tern, Texas snowbells, Tobusch fishhook cactus, or Devil's River minnow in Val

Verde County. Therefore, those species and habitats will not be addressed in this Biological Resources Plan (BRP).

On April 1, 2008, the Secretary of DHS, pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure expeditious construction of tactical infrastructure along the U.S./Mexico international border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws that are included in the waiver, including the Endangered Species Act, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment. To that end, CBP has prepared the following BRP, which analyzes the potential impacts on threatened and endangered species associated with construction of tactical infrastructure in the USBP's Del Rio Sector. The BRP also discusses CBP's plans as to how potential impacts on threatened and endangered species can be mitigated. The BRP will help to guide CBP's efforts going forward.

BIOLOGICAL RESOURCES PLAN
DEL RIO SECTOR

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1. PROJECT DESCRIPTION

The U.S Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP), U.S. Border Patrol (USBP) plans to construct, maintain, and operate tactical infrastructures along sections of the U.S./Mexico international border that are not currently fenced. The design that meets the USBP Del Rio Sector's operational needs is primary pedestrian fence with an aesthetic quality in Section M-1 and a concrete retaining wall and primary pedestrian fence with an aesthetic quality designated as Section M-2A.

On April 1, 2008, the Secretary of DHS, pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), exercised his authority to waive certain environmental and other laws in order to ensure expeditious construction of tactical infrastructure along the U.S./Mexico international border. Although the Secretary's waiver means that CBP no longer has any specific legal obligations under the laws that are included in the waiver, including the Endangered Species Act, the Secretary committed the Department to responsible environmental stewardship of our valuable natural and cultural resources. CBP strongly supports this objective and remains committed to being a good steward of the environment. To that end, CBP has prepared the following BRP, which analyzes the potential impacts on threatened and endangered species associated with construction of tactical infrastructure in the USBP's Del Rio Sector. The BRP also discusses CBP's plans as to how potential impacts on threatened and endangered species can be mitigated. The BRP will help to guide CBP's efforts going forward.

1.1 LOCATION

The Project is in two discrete areas within the Del Rio Sector. Section M-1 is near Del Rio, Texas, in Val Verde County. Section M-2A is near Eagle Pass, Texas, in Maverick County. Both sections are bordered by the Rio Grande to the west along the U.S./Mexico international border (see **Figures 1-1** and **1-2**). Each section will be an individual project that could proceed independently of the other section. Construction of the tactical infrastructure for both sections will begin in spring 2008 and continue through December 2008.

1.1.1 Section M-1

Section M-1 (see **Figure 1-1**) will follow outside of the U.S. Section, International Boundary and Water Commission (USIBWC) floodway and inside of the Federal Emergency Management Agency (FEMA) 100-year floodplain. Also included in the Project are removal of a 150-foot corridor of invasive giant reed and other brush, the construction of an access and patrol road, and the installation of permanent lights along the entire length of the primary pedestrian fence section. The Project is not expected to affect listed species in Section M-1 and therefore, will not be described in further detail in this BRP.

1.1.2 Section M2-A

Section M2-A is in Maverick County within the city limits of Eagle Pass, Texas, and adjacent to the city-owned Eagle Pass Golf Course (see **Figure 1-2**). The Rio Grande defines the boundary to the west and a mix of residential and commercial properties are adjacent to the Project area to the east. The Project will be an extension of Section M-2B, an already approved project to the south of Section M-2A.

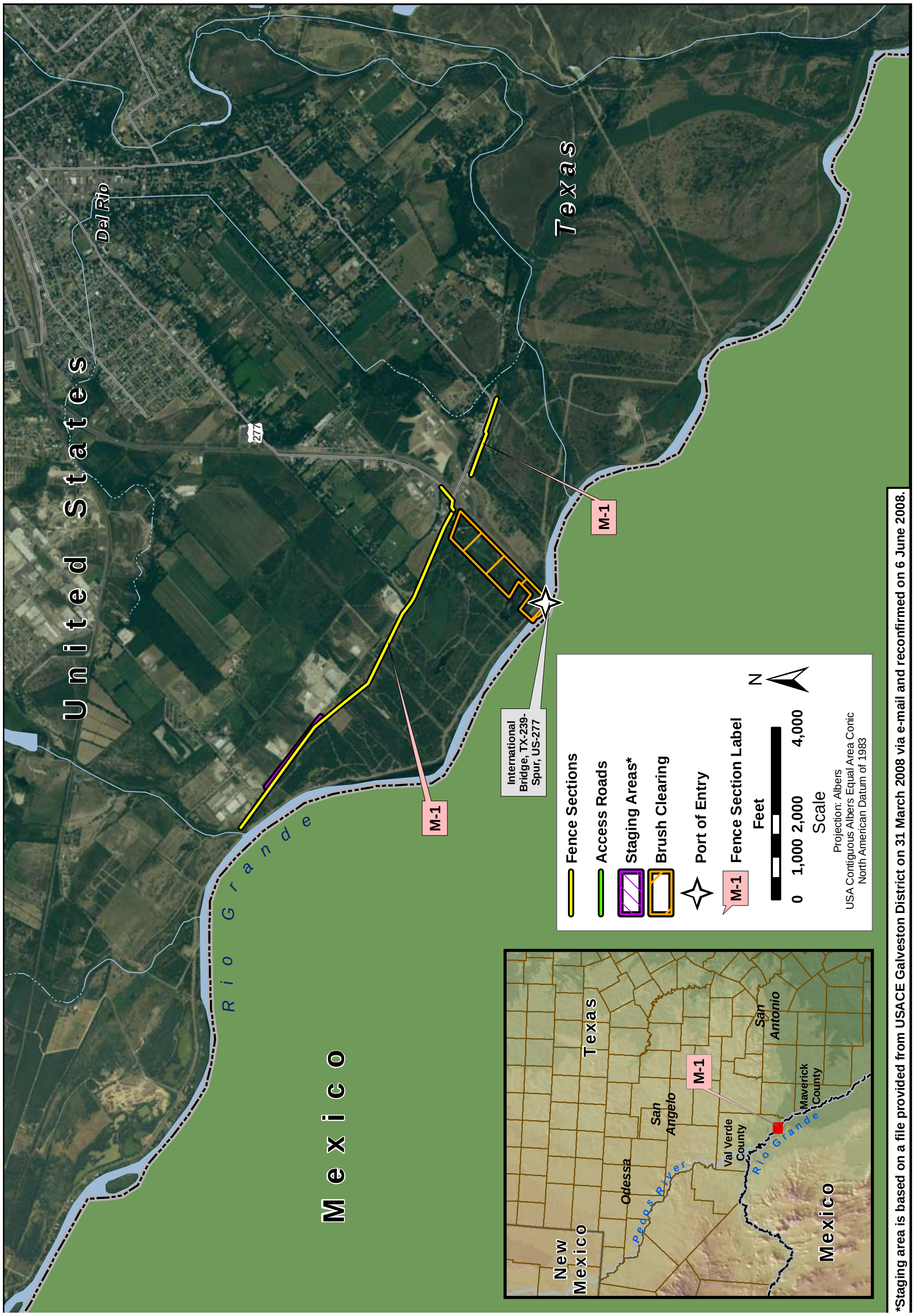
1.2 CONSTRUCTION

CBP will construct, maintain, and operate approximately 1 mile of tactical infrastructure consisting of a primary pedestrian fence, concrete retaining wall, patrol road, and permanent lights in the vicinity of Eagle Pass along the U.S./Mexico international border in Maverick County, Texas. The Project will also include improvements to an existing road that will be used for construction access and patrol roads.

The Project will impact an approximately 60-foot wide corridor that will be wider or narrower in some areas along the primary pedestrian fence (see **Figure 1-3**). At its widest, the corridor will be approximately 145 feet wide between the two existing roads. For much of its length the corridor will be about 20 feet wide. To provide a clear line of sight for border patrol agents, the corridor will be maintained free of tall vegetation, where it is possible to do so without cutting giant reed west of the existing road, adjacent to where the 0.11-mile primary pedestrian fence will be built. A narrower strip of vegetation will be cleared east of the existing road, adjacent to where the 0.64-mile retaining wall will be built. Vegetation clearing will not occur west of the westernmost existing road. Initial vegetation removal will be completed by grading, contouring, and trenching and the use of herbicide to control regrowth.

Construction access roads will be 30 to 60 feet wide. Wherever possible, existing roads and previously disturbed areas will be used for construction access and staging areas. If fill material is needed, the selected construction contractor will use clean material from commercially available sources that do not pose an adverse effect on biological or cultural resources.

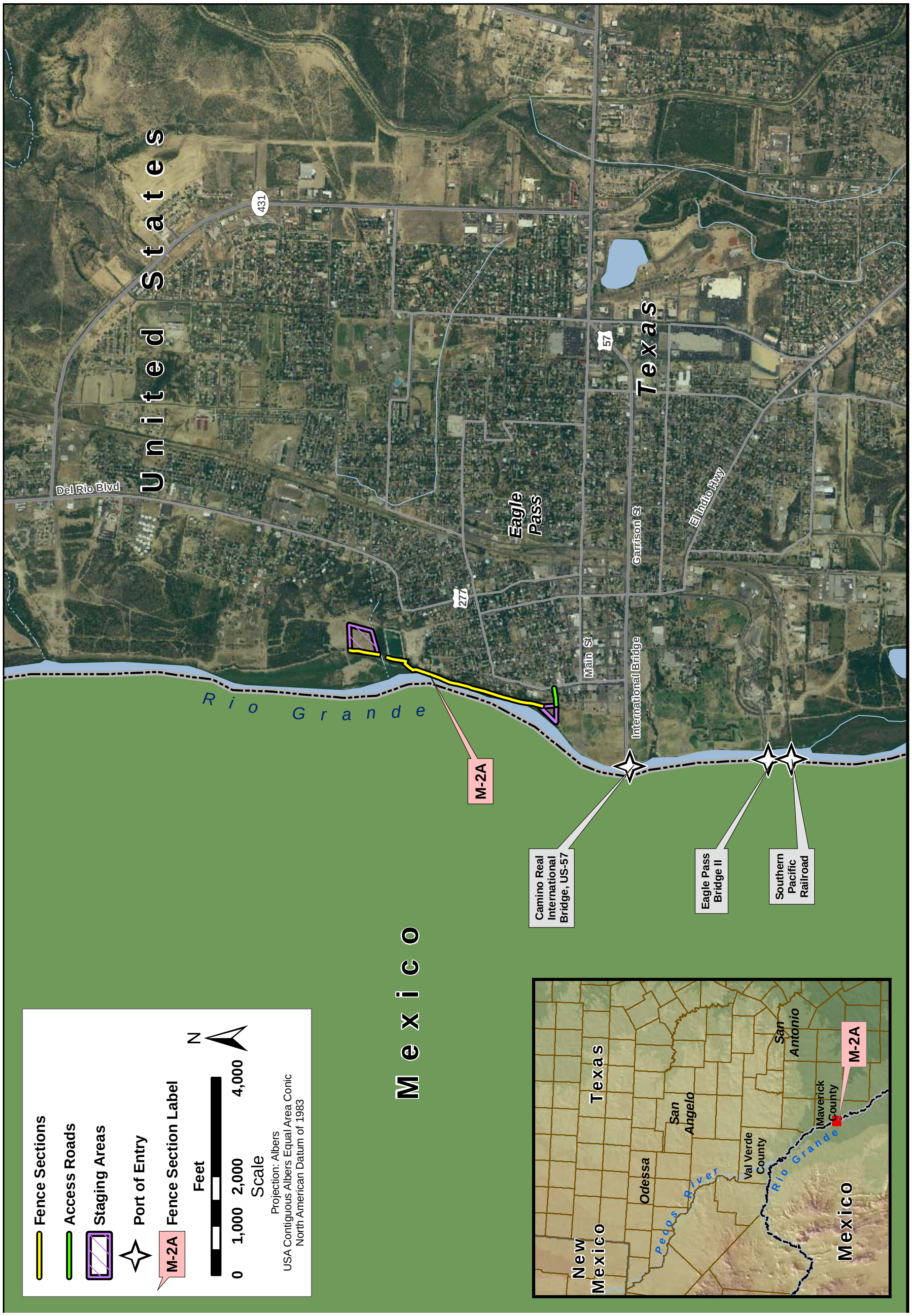
Vegetation removal for Section M-2A, where ocelot and jaguarundi could occur, is minimized to 2.2 acres. Giant reed will not be cleared along the bank of the Rio Grande in Section M-2A. Denuded areas will be revegetated with low-growing, native herbaceous species to stabilize soils while maintaining the open nature of the site. Vegetation within the impact corridor will be maintained, so as not to impair the line of sight for border patrol agents.



*Staging area is based on a file provided from USACE Galveston District on 31 March 2008 via e-mail and reconfirmed on 6 June 2008.

Source: ESRI StreetMap USA 2005

Figure 1-1. Location of the Section M-1, Del Rio, Texas



Source: ESRI StreetMap USA 2005

Figure 1-2. Location of the Section M-2A, Eagle Pass, Texas

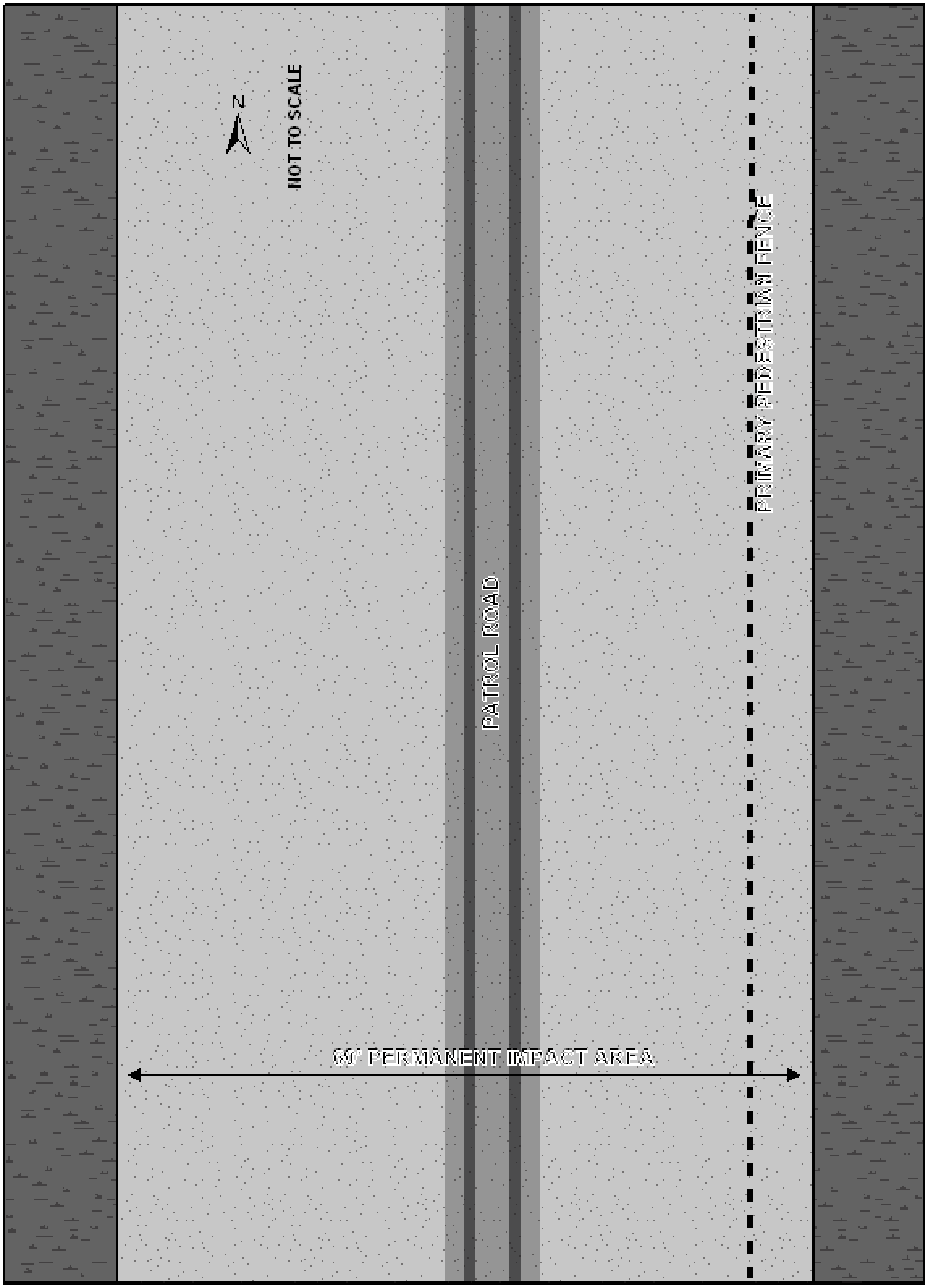


Figure 1-3. Schematic of Typical Project Footprint – Section M-2A

The route for the Project will generally follow the Rio Grande and will connect to an approved, planned fence (Section M-2B) with an evaluated and approved Environmental Assessment (EA) (DHS 2007). The EA for M-2B was released for a 30-day public review period beginning January 11, 2007 and ending February 9, 2007. During the EA process a total of two comments were received and the EA is available on the *www.BorderFencePlanning.com* Web site. Section M-2B will be primary pedestrian fence with an aesthetic quality and will run between two POEs along the west edge of downtown Eagle Pass and onto the city golf course. Additional information on Section M-2B is provided in **Section 1.4 of the ESP**

Construction of the tactical infrastructure in Section M-2A would result in approximately 2.21 acres of permanent vegetation removal. However, giant reed will not be cleared along the bank of the Rio Grande in Section M-2A. Disturbances to vegetation in temporary impact areas will be rehabilitated. Rehabilitation will include revegetating or the distribution of organic materials over the disturbed area to reduce erosion while allowing the area to naturally vegetate.

Best Management Practices (BMP's) will be used to minimize the potential for erosion and sedimentation and control of fugitive dust during construction. Erosion control tools such as silt fencing, rice straw mulch, and biodegradable geotextile mats will be placed in areas assessed to be an erosion risk. A mix of native grass seeds will be hydromulched onto freshly disced soils in the project area to provide cover and reduce erosion. No hay or straw bales containing nonnative invasive seeds will be used.

All construction equipment and vehicles will be required to be kept in good operating condition to minimize noise and exhaust emissions. Staging areas will be utilized within the project area to store machinery and construction equipment. CBP will avoid construction during the bird nesting season (March to September), or conduct migratory bird surveys prior to construction to avoid impacts to active nests. CBP will implement migratory bird BMPs, to the maximum extent practicable.

1.2.1 Primary Pedestrian Fence

The primary pedestrian fence will be adjacent to urban areas and outside of potential cat migration areas and will connect to a previously planned fence (Section M-2B) with existing NEPA documentation in Eagle Pass, Texas, and will consist of an primary pedestrian fence and concrete retaining wall. Approximately 0.64 miles of the tactical infrastructure will be a 15- to 18-foot-high concrete retaining wall and the remaining 0.11 miles will be a pedestrian fencing. The primary pedestrian fence will be constructed within an approximate 60-foot corridor with wider and narrower areas (see additional detail above) and would permanently remove approximately 2.21 acres of vegetation. The infrastructure can vary in location within the corridor.

The primary pedestrian fence will be 14 feet high and will run north/south within a 30-foot right-of-way along the residential area (see **Figure 1-4**). The metal fence will be attached to square main posts (spaced approximately 33 feet apart) and intermediate I-beam posts (spaced approximately 100 inches apart) anchored in the ground with concrete.

Figure 1-4. Example of a Pedestrian Fence with an Aesthetic Quality

1.2.2 Patrol Roads

Tactical infrastructure will also include the improvement of patrol roads along the entire length of the primary pedestrian fence. Patrol roads typically run parallel to and a few feet west of the primary pedestrian fence. The existing road is approximately 0.8 miles long. Improvements to the existing patrol road will include widening the road to a two-lane patrol road. A 20-foot-wide right-of-way will be used for any cut-and-fill operations and improvements to the existing roadway. The roadway and adjacent shoulders will be 20 feet wide. Road improvements will include grading, removal of vegetation, widening, adding caliche (if necessary for construction), and treatment of the road surface with a soil stabilizer. No additional access roads will be required to complete construction activities. Upon completion, a regular maintenance schedule will be followed.

Vehicular traffic associated with the construction, operation, and maintenance activities will remain on established roads to the maximum extent practicable. Rehabilitation of affected soils will include revegetation of the disturbed area to reduce erosion while allowing the area to return to native vegetation. Erosion control measures will be utilized. Any excess soils not used during construction of the tactical infrastructure will be hauled from the site and disposed of properly.

1.3 GATES

Gates will be constructed to allow CBP and landowners access to land, the Rio Grande, and water resources including pumphouses and related infrastructure. Gates will also be situated to provide access to water resources, including pumphouses and related infrastructure, grazing areas, existing parks, and some other areas.

1.4 LIGHTS

Additionally, CBP is proposing to construct and operate permanent lighting. Lighting locations are determined by CBP based on projected operational needs of the specific area. The permanent lighting will be stadium-type lights on approximately 30- to 40-foot high poles, with two to four lights per pole. Each light will have a range of 400 to 1,000 watts, with lower-wattage bulbs used where feasible. Each light pole will be constructed approximately every 100 yards. Wooden poles, encased in concrete and steel culvert pipe to prevent them from being cut down, will most often be used, although steel poles with concrete footings might also be used. The poles might be existing poles or they might need to be installed. Electricity will be run in overhead lines unless local regulations require the lines to be underground. Lights will operate from dusk to dawn. The final placement and direction of lighting has been and will continue to be coordinated with the U.S. Fish and Wildlife Service (USFWS).

Permanent night lighting at primary pedestrian fences, barriers, and surveillance sites will be the minimum needed to achieve operational purposes. At primary pedestrian fences, barriers, and related sites, lights will be shielded and directed into the designated security zone.

Permanent lights will be placed at approximately 100-yard intervals along the primary pedestrian fence. The permanent lights will consist of sixlights and will be anchored in the ground in holes 6 feet deep and 3 feet in diameter, filled with concrete, and attached to 40-foot poles.

The lights will be placed on the east side of that corridor and illuminate the patrol road and primary pedestrian fence but avoid illumination of the riparian vegetation outside the impact corridor. The installation of the permanent lights will increase the visibility within the project area that is not already illuminated by existing lights. This would reduce impacts on large and medium sized animals, bats, and birds. Lighting will be designed so that the riparian corridor is not illuminated and therefore, will not be disrupting to the activities of large and medium sized animals, bats, birds and other wildlife activities. Light reaching any adjacent threatened and endangered species habitat will be no greater than 1.5 foot candles. Lights will not be placed in any areas such that illumination of the riparian corridor would exceed 1.5 foot candles.

1.5 OPERATIONS AND MAINTENANCE

There will be no significant change in USBP Del Rio Sector operations based on the Project. Operations within the USBP Del Rio Sector routinely adapt to evolving operational requirements, and will continue to do so under the Project. The Del Rio Sector will retain its current flexibility to use the most effective methods to provide a law enforcement resolution to illegal cross-border activity.

Maintenance of the primary pedestrian fence will include removal of debris and vegetation (as specified in **Sections 1.2** and **1.6** of this BRP), and fence and wall repair, when necessary. The fences will be made from nonreflective steel. No painting will be required. Fence maintenance will include removing any accumulated debris on the fence after a rain event to avoid potential future flooding. Soil/sand that builds up against the fence and brush will also be removed as needed. Vegetation clearing will maintain a clear line of sight near the new primary pedestrian fence and concrete retaining wall. Any destruction or breaches of the fence will be repaired, as needed.

1.6 BEST MANAGEMENT PRACTICES

1.6.1 General BMPs

The following BMPs will be implemented, to the maximum extent practicable, as a part of these actions to avoid or minimize impacts on federally listed resources;

1. CBP will develop (in coordination with the USFWS) a training plan regarding Trust Resources for CBP and construction personnel. At a minimum, the program should include the following topics: Occurrence of the listed and sensitive species in the area, their general ecology, sensitivity of the species to human activities, and project features designed to reduce the impacts on these species and promote continued successful occupation of the project area environments by the species.

   Included in this program should be color photos of the listed species, which should be shown to the employees. Following the education program, the photos should be posted in the contractor and resident engineer office, where they should remain through the duration of the Project. The construction manager will be responsible for ensuring that employees are aware of the listed species. This BMP does not apply to border patrol operations.

2. Project Reports. Within 3 months of project completion, a Project Report will be developed that details the BMPs that were implemented, identifies how well the BMPs worked, ways that BMPs could be improved for either protection of species and habitats or implementation efficiency, and reports on any federally listed species observed at or near the project site. If site restoration was included as part of the Project, information on the implementation of that restoration and any follow-up monitoring will

be included. Documentation of the completion of any compensation actions should be included in the report. The Project Report will be made available to USFWS.

3. Relocation of individuals of federally listed plants found in the project area is generally not a suitable activity. Relocation of aquatic species is not appropriate. Relocation of small cacti has not been very successful, and is not recommended. Survival rates of translocated plants are usually very low; however, translocation may be considered where there are no other alternatives. For particular actions, the USFWS will advise CBP regarding relocation of plants.

4. Individual federally listed animals found in the project area should not be harassed and should be allowed to leave on their own volition, to the extent possible, construction schedule permitting.

5. All construction and maintenance projects in federally listed habitats should have a designated biological monitor on site while work is in progress, to the extent practicable. The biological monitor will be responsible for documenting implementation of construction-related BMPs as designed for the Project to reduce the potential for adverse effects on the species or their habitats.

6. Where, based on species location maps or results of surveys, individuals of a federally listed species could be present on or near the project site, a designated biological monitor should be present during the activity and to the extent practicable to protect individuals of the species from harm. Duties of the biological monitor should include ensuring that activities stay within designated project areas, evaluating the response of individuals that come near the project site, and implementing the appropriate BMP.

   The designated biological monitor will notify the construction manager of any activities that may harm or harass an individual of a federally listed species. Upon such notification, the construction manager shall temporarily suspend all activities in question and notify the Contracting Officer, the Administrative Contracting Officer, and Contracting Officer's Representative of the suspense so that the key USACE personnel may be notified and the potential conflict resolved.

7. Where a project could be located within 1 mile of occupied species habitats but it has been determined through coordination with the USFWS that individuals are not likely to move into the project area, a biological monitor is not needed. However, the USACE construction representative should be aware of the species location and ensure that BMPs designed to minimize habitat impacts are implemented and maintained as planned. If a listed species is observed, the USFWS should be contacted and the need for a biological monitor should be assessed.

8. Particular importance is given to proper design and locating roads such that the potential for roadbed erosion into federally listed species habitat should be avoided or minimized.
9. Particular importance is given to proper design and road location so that the potential for entrapment of surface flows within the roadbed due to grading should be avoided or minimized. Depth of any pits created should be minimized so animals do not become trapped.
10. Particular importance is given to proper design and locating roads such that the widening of existing or created roadbed beyond the design parameters due to improper maintenance and use should be avoided or minimized.
11. Particular importance is given to proper design and locating roads such that, to the extent practicable, stream crossings should not be located near or at bends or meanders but rather at straight stream reaches where channel stability is enhanced.
12. Particular importance is given to proper design and locating of roads such that excessive use of unimproved roads that results in their deterioration and affects the surrounding federally listed species habitat areas will be minimized. Road construction and road use for construction will be monitored and documented in the Project Report.
13. Particular importance is given to proper design and locating roads such that the minimal number of roads needed for construction, should be constructed and maintained to proper standards. Roads no longer needed by the government should be closed and restored to natural surface and topography using appropriate techniques. The Global Positioning System (GPS) coordinates of roads that are thus closed should be recorded and integrated into the CBP Geographic Information System (GIS) database. A record of acreage of miles of roads taken out of use, restored, and revegetated, should be maintained.
14. The perimeter of all areas to be disturbed during construction or maintenance activities should be clearly demarcated using flagging or temporary construction fence, and no disturbance outside that perimeter should be authorized.
15. Materials such as gravel or topsoil should be obtained from existing developed or previously used sources, not from undisturbed areas adjacent to the project area.
16. All access routes into and out of the project disturbance area should be flagged, and no construction-related travel outside of those boundaries should be authorized.
17. If new access is needed or existing access requires improvement to be usable for the Project, BMPs included under Road Construction and Maintenance should be incorporated into the access design and implementation and should be coordinated with the USFWS.

18. When available, disturbed areas or areas to be used later in the construction period should be used for staging, parking, and equipment storage.
19. Within the designated disturbance area, grading or topsoil removal should be limited to areas where this activity is needed to provide the ground conditions needed for construction or maintenance activities. Minimizing disturbance to soils should enhance the ability to restore the disturbed area after the Project is complete.
20. Removal of trees and brush in federally listed species habitats should be limited to the smallest amount needed to meet the objectives of the Project. This would likely be a permanent impact on habitat.
21. Water for construction use shall be from wells or irrigation water sources at the discretion of the landowner (depending on water rights). If local groundwater pumping creates an adverse effect on aquatic-, marsh-, or riparian-dwelling federally listed species, treated water from outside the immediate area will be utilized.
22. Surface water from aquatic or marsh habitats should not be used if that site supports aquatic federally listed species or if it contains nonnative invasive species or disease vectors and there is any opportunity to contaminate a federally listed species habitat through use of the water at the project site.
23. Wells or irrigation water sources should be used when within one mile of aquatic habitat for federally listed aquatic species. This is to prevent the transfer of invasive animals or disease pathogens between habitats if water on the construction site was to reach the federally listed species habitats.
24. Storage tanks containing untreated water should be of a size that if a rainfall event were to occur (assuming an open tank), the tank would not be overtopped and cause a release of water into the adjacent drainages. Water storage on the project area should be in on-ground containers located on upland areas not in washes.
25. Pumps, hoses, tanks, and other water storage devices should be cleaned and disinfected with a 10% bleach solution at an appropriate facility (this water is not to enter any surface water area) before use at another site, if untreated surface water was used. If a new water source is used that is not from a treated or groundwater source, the equipment should require additional cleaning. This cleaning is important to kill any residual disease organisms or early life stages of invasive species that may affect local populations of federally listed species.
26. CBP should develop and implement storm water management plans for every project.
27. All construction shall follow DHS Management Directive 5100 for waste management.

28. A CBP-approved spill protection plan should be developed and implemented at construction and maintenance sites to ensure that any toxic substances are properly handled and any escape into the environment prevented. Agency standard protocols should be used. Drip pans underneath equipment, containment zones used when refueling vehicles or equipment, and other measures are to be included.

29. Nonhazardous waste materials and other discarded materials, such as construction waste, should be contained until removed from the construction site. This should assist in keeping the project area and surroundings free of litter and reduce the amount of disturbed area needed for waste storage.

30. To eliminate attraction to predators of protected animals, all food-related trash items, such as wrappers, cans, bottles, and food scraps, should be disposed of in closed containers and removed daily from the project site.

31. Waste water (water used for project purposes that is contaminated with construction materials or was used for cleaning equipment and thus carries oils or other toxic materials or other contaminants in accordance with state regulations) is to be stored in closed containers on site until removed for disposal. Concrete wash water should not be dumped on the ground, but is to be collected and moved offsite for disposal. This wash water is toxic to aquatic life.

32. Waste management may be of special concern at staging areas, work camps, bivouacs, and camp details. Provision for proper waste disposal at these sites should be made and implementation of waste management protocols made the responsibility of the appropriate project officers.

33. Construction speed limits will not exceed 35 miles per hour (mph) on major unpaved roads (graded with ditches on both sides) and 25 mph on all other unpaved roads. Night time travel speeds will not exceed 25 mph, and might be less based on visibility and other safety considerations. Construction at night will be minimized.

34. If construction activities would continue at night, all lights should be shielded to direct light only onto the work site and the area necessary to ensure the safety of the workers, the minimum foot candles needed, should be used, and the number of lights should be minimized.

35. Noise levels for day or night construction and maintenance should be minimized. All generators should be in baffle boxes (a sound-resistant box that is placed over or around a generator), have an attached muffler, or use other noise-abatement methods in accordance with industry standards.

36. Transmission of disease vectors and invasive nonnative aquatic species can occur if vehicles cross infected or infested streams or other waters and water or mud remains on the vehicle. If these vehicles subsequently cross or enter uninfected or noninfested waters, the disease or invasive species may be introduced to the new area. To prevent this, crossing of

streams or marsh areas with flowing or standing water should be avoided, and, if not, the vehicle should be sprayed with a 10 percent bleach solution.

37. Materials used for onsite erosion control in uninfested native habitats should be free of nonnative plant seeds and other plant parts to limit potential for infestation. Since natural materials cannot be certified as completely weed-free, if such materials are used, there should be follow-up monitoring to document establishment of nonnative plants and appropriate control measures should be implemented for a period of time to be determined in the site restoration plan.

38. Permanent night lighting at fences, barriers, and surveillance sites should be the minimum needed to fully achieve operational purposes. At fences, barriers and related sites; lights should be shielded and directed into the designated security zone. Light reaching any adjacent federally listed habitat should be no greater than 1.5 foot candles. This is important for large and medium animals, bats, and birds.

39. For construction purposes, infrastructure sites should only be accessed using designated roads. Parking should be in designated areas. This should limit the development of multiple trails to such sites and reduce the effects on federally listed habitats in the vicinity.

40. Light poles and other pole-like structures should be designed to discourage roosting by birds, particularly raptors that may use the poles for hunting perches.

41. Appropriate techniques to recontour the site, replace soils, and restore proper drainage should be implemented.

42. During follow-up monitoring and during maintenance activities, invasive plants that appear on the site will be removed. Mechanical removal will be done in ways that eliminate the entire plant and remove all plant parts to a disposal area. All chemical applications on refuges must be used in coordination with the refuge manager to ensure accurate reporting. Herbicides can be used according to label directions. The monitoring period will be defined in the site restoration plan. Training to identify non-native invasive plants will be provided for CBP contractor personnel or contractors, as necessary.

43. To prevent entrapment of wildlife species during emplacement of vertical posts/bollards, all vertical fence posts/bollards that are hollow (i.e., those that should be filled with a reinforcing material such as concrete), shall be covered to prevent wildlife from entrapment. Covers should be deployed from the time the posts or hollow bollards are erected to the time they are filled with reinforcing material.

1.6.2 Species-Specific BMPs

Ocelot

1. Pre-construction surveys should identify any ocelot habitat in or adjacent to the project area and the presence of the ocelot at the habitat area should be assumed.
2. During construction activities in or within 500 feet of ocelot habitat (or such distance that noise, light, or other effects reach the habitat), a biological monitor will be present on site to advise the construction manager to temporarily suspend construction whenever the appropriate BMPs agreed to are not being properly implemented.
3. In planning for roads, fences, and other facilities that would require land clearing, include avoidance of wetlands, dense thornscrub and riparian vegetation as a consideration for facility location.
4. Removal of wetland habitat, dense thornscrub or riparian vegetation should be avoided or minimized.
5. Removal of dense thornscrub or riparian vegetation within the conservation easements established by the USIBWC for the Rio Grande will be avoided to the extent practicable.
6. To the extent practicable, impermeable fences/barriers should not be constructed that bisect or fragment ocelot dispersal corridors.
7. To the extent practicable, if freshwater sources are limited, impermeable barriers should not be constructed that could prevent ocelot access to fresh water.
8. Where artificial lighting must be used, directed (shielded) lighting should be used and directed away from ocelot (thornscrub and riparian) habitat. Lighting intensity should be minimized and light reaching any adjacent threatened and endangered species habitat should be no greater than 1.5 foot candles.
9. Documentation of ocelots in project and activity areas will be reported to the USFWS.
10. Construction activities should be conducted during daylight hours only to avoid noise and lighting issues during the night. If construction or maintenance work activities would continue at night, all lights should be shielded to direct light only onto the area required for worker safety and productivity, the minimum wattage needed should be used, and the number of lights should be minimized.

Jaguarundi

11. Pre-construction surveys should identify any jaguarundi habitat in or adjacent to the project area and the presence of the jaguarundi at the habitat area should be assumed.
12. During construction activities in or within 500 feet of jaguarundi habitat (or such distance that noise, light, or other effects reach the habitat), a biological monitor will be present on site to advise the construction manager to temporarily suspend construction whenever the appropriate BMPs agreed to are not being properly implemented.
13. In planning for roads, fences, and other facilities that would require land clearing, include avoidance of wetlands, dense thornscrub and riparian vegetation as a consideration for facility location.
14. Removal of wetland habitat, dense thornscrub or riparian vegetation should be avoided or minimized.
15. Removal of dense thornscrub or riparian vegetation within the conservation easements for the cat corridor established by the USIBWC along the Rio Grande should be avoided, to the extent practicable for operational purposes.
16. To the extent practicable, impermeable fences/barriers should not be constructed that bisect or fragment jaguarundi dispersal corridors.
17. To the extent practicable, if freshwater sources are limited, impermeable barriers should not be constructed that prevent jaguarundi access to fresh water.

1.6.3 Compensation

1. A ratio of 1.1:1 will be used to compensate for loss (permanent removal) of 2.2 acres of vegetation within the project area. Total compensation area, therefore, will involve 2.42 acres. The area will be initially revegetated with native grasses/forbs for soil stabilization. Vegetation within the impact corridor will be maintained so as not to impair line of sight for border patrol agents. Coordination with the Corpus Christi Ecological Services Office and the Texas State Botanist will precede development of a final revegetation plan to the extent practicable.

2. DESCRIPTION OF THE SPECIES AND THEIR HABITAT

2.1 OCELOT

In 1982, the ocelot *(Leopardus pardalis*) was designated as an endangered species under the Endangered Species Act of 1973, as amended, a status that extended U.S. protections to the species throughout its range in 22 countries, including Texas, Mexico, and Central and South America. Critical habitat has not been designated for the ocelot. Ocelot populations gained greater protections in 1989, when the species was upgraded to Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES), a protection that prohibits CITES signatories from permitting any trade in the species or its parts. Two subspecies occur in the United States: the Texas ocelot (*L.p. albescens*) and the Sonoran ocelot (*L.p. sonoriensis*). The Texas ocelot is isolated from the Sonoran ocelot by the Sierra Madre highlands (Tewes and Schmidly 1987, USFWS 1990).

2.1.1 Species Description

The ocelot is a medium-sized cat, measuring up to 3 feet (.91 meters [m]) in body length and weighing twice as much as a large domestic cat. It is slender and covered with attractive, irregular-shaped rosettes and spots that run the length of its body. The ocelot's background coloration can range from light yellow, to reddish gray, to gold, to a grayish gold color. They have a white underside. The head has spots, two black stripes on the cheeks, four to five longitudinal black stripes on the neck and their black ears have large white spots on the back. The tail has dark bars or incomplete rings. Though it resembles the margay (*Leopardus wiedii*) the ocelot is approximately twice the size of a margay with a slightly shorter tail (Murray and Gardner 1997, de Oliveira 1998).

2.1.2 Distribution and Abundance

Historically, the ocelot occurred in Arkansas, Arizona, southern California, Texas, Mexico, and southward through Central and South America to Peru, Uruguay, and northern Argentina (Navarro-Lopez 1985). Today it ranges from southern Texas and northern Sonora, Mexico, to Central America, Ecuador, and northern Argentina, but in reduced numbers (Tewes and Everett 1986, Emmons 1990, Murray and Gardner 1997).

Two U.S. populations of ocelot occur in southern Texas (Tewes and Everett 1986). One population occurs in Willacy and Kenedy counties primarily on private lands (Navarro-Lopez 1985) and the other in Cameron County primarily on the Laguna Atascosa National Wildlife Refuge (Laack 1991).

In Texas, over the past 20 years, individual ocelots have only been documented in Cameron, Hidalgo, Willacy, Kenedy and Jim Wells counties (Tewes and

Hughes 2001). Laack and Rappole (1986) documented ocelot sightings in Cameron County. Shinn (2002) used camera traps and hair snares on 25 widely scattered tracts managed by the South Texas Refuges Complex, and did not find evidence of ocelot west of Brownsville on the Rio Grande. His studies did confirm the presence of the species in extreme southern Cameron County and in extreme western Willacy County.

In Hidalgo County, at the Santa Ana National Wildlife Refuge at least one ocelot has been radio-tracked from the 1990s and it is believed that they might still occur in the area (Mays 2007). Fischer (1998) trapped, radio-tracked, and tagged an adult female from 1992 through 1996 along the Rio Grande in southeastern Hidalgo County. Out of 8,304 trap-nights he caught 21 bobcats, 300 nontarget animals, and no other ocelots.

In 1982, Tewes (1986) trapped 2 ocelots on a private ranch in Willacy County. Five ocelots (3 females, 1 male, and 1 of unknown sex) were identified in Willacy County near Raymondville, Texas, in December 2002. Based on two photographs on October 11, 2003, one of the females was pregnant; therefore, a sixth resident ocelot might have been born (Sternberg and Chapa 2004). Between October and December 2003, camera traps photographed three cats on another private ranch in Willacy.

“Occupied habitat” occurring in Jim Wells, Nueces, Live Oak, and Kleberg counties, 50 miles north of the Willacy-Kenedy population is shown in Figure 9 of the recovery plan (USFWS 1990). It is presumed that ocelots still occur there because of documented roadkills on Highway 77 south but no reproducing populations have been found. In 1997 and 1998, Tuovila (1999) did a trapping study in the southern half of Live Oak County and northernmost Jim Wells. He trapped 17 bobcats and 238 nontarget animals, but no ocelots. No ocelots were documented at Choke Canyon Reservoir in Live Oak and McMullen counties, Texas, during trapping efforts despite a 10-year increase in optimal ocelot cover (Grassman et al. 2006).

Tewes and Everett (1986) based a “crude estimate” of the total ocelot population size in south Texas from 80 to 120 individuals upon an aerial survey of brush habitat and knowledge gained from following the movements of radio-collared ocelots trapped in or near Laguna Atascosa National Wildlife Refuge. Haines et al. (2005a) estimated the number of breeding individuals in the Laguna Atascosa National Wildlife Refuge population was 19 ocelots with a total population of 38 ocelots in Cameron County. He estimated the population by averaging ocelot home range sizes reported by Navarro-Lopez (1985), Tewes (1986), and Laack (1991) and extrapolating this estimate to the amount of available dense thornscrub habitat and assumed adults equaled half of the total population. Today, as few as 50 to 100 individuals might remain in south Texas and the United States. The Cameron County ocelot population is estimated at 25 to 35 individuals (Mays 2007).

A much larger population of the Texas ocelot occurs in Tamaulipas, Mexico, near San Fernando, approximately 100 miles south of the U.S.-Mexico international border (Caso 1994). In forested South America alone, Emmons (1988) noted that even at the lowest density estimates (one animal per 5 square kilometers [km^2]) there will be approximately 800,000 ocelots, and suggested that true numbers are probably 1.5 to 3 million.

Unconfirmed sightings of ocelots near Eagle Pass, Maverick County, Texas, have been documented in 1957, 1970, 1991, and 1993, most within the vicinity of the Dos Republicas Coal Mine area.

2.1.3 Habitat

Tamaulipan brushland is a unique ecosystem, found only in south Texas and northeastern Mexico. Characteristic vegetation of Tamaulipan brushland is dense and thorny. It is estimated approximately 95 percent has been cleared for agriculture, urban development, road developments and expansions, and recreation (USFWS 1990, Jahrsdorfer and Leslie 1988). Tewes and Everett (1986) found less than 1 percent of southern Texas supported the extremely dense thornscrub used by ocelots.

Tewes and Everett (1986) classified ocelot habitat in Texas according to the amount of foliar canopy. Class A or optimal habitat was 95 percent canopy cover, Class B or suboptimal habitat was 75 percent to 95 percent canopy cover, and Class C, with 75 percent or less canopy cover, was considered inadequate. The most critical habitat component is probably dense cover near the ground (less than 3 feet in height) and that core areas of ocelot home ranges on Laguna Atascosa National Wildlife Refuge contained more thornscrub than peripheral areas of their home ranges. Jackson et al. (2005) suggest that the ocelot in Texas prefers closed canopy over land cover types, but that areas used by this species tend to consist more of patches of vegetation with more edge. The cat is reported to occur along watercourses, and will readily enter the water (Goodwyn 1970 as cited by USFWS 1990), but it is unclear if this proximity to water is a habitat requisite or simply an indication of where dense cover is most likely to occur.

Species composition of shrubs used by ocelots was quantified in three plant communities, two in Texas and one in Mexico (Shindle and Tewes 1998, Caso 1994). At the Texas sites, 45 woody species were found at the Laguna Atascosa National Wildlife Refuge in Cameron County and 28 woody species on a private ranch in Willacy County (Shindle and Tewes 1998). The dominant species were granjeno (*Celtis pallida*), crucita (*Eupatorium odoratum*), Berlandier fiddlewood (*Citharexylum berlandieri*), honey mesquite (*Prosopis glandulosa*), and desert olive (*Forestiera angustifolia*) at Laguna Atascosa National Wildlife Refuge, and honey mesquite and snake-eyes (*Phaulothamnus spinescens*) in Willacy County.

In Mexico, ocelot habitat use was 97.6 percent mature forest (heavy rain forest to sparse tropical deciduous forest) and 2.4 percent pasture-grassland (Caso 1994). In Veracruz, Hall and Dalquest (1963) found ocelots used the forests and jungles. Ocelots are known from the tropical forest of Belize, lowland rain forest of Peru, and semideciduous forest and seasonally flooded marshes of Brazil (Ludlow and Sunquist 1987).

The ocelot is currently restricted to habitat in Cameron, Duval, Hidalgo, Jim Wells, Kenedy, Kleberg, Live Oak, McMullen, Nueces, San Patricio, Starr, Willacy, and Zapata counties. The ocelot has been recorded in Maverick County in the late 1950s, early 1970s, 1981, and 1993.

No confirmed sightings of ocelots exist for the project area itself. Ocelots currently in the study area might use tracts of brush habitat adjacent to the project area, and the giant reed along the Rio Grande as travel or dispersal corridors. Surveys conducted on March 14 and 15, 2006, for the Eagle Pass Golf Course project determined there was suitable dispersal cat habitat present within the project corridor. Surveys were conducted November 5 and 6, 2007, for the Project (e²M 2007). No ocelots were observed.

2.1.4 Life History

The ocelot is primarily nocturnal, although some diurnal activity has been recorded (Navarro-Lopez 1985, Tewes 1986, Tewes and Schmidly 1987, Laack 1991, Caso 1994). Navarro-Lopez (1985) found ocelots in Texas to have two peaks of activity, one at about midnight and the other at daybreak. Ocelots are solitary hunters and eat a wide variety of prey, but mammals, especially rodents, make up the bulk of their diet (Bisbal 1986, Emmons 1987, USFWS 1990). Other items of prey include birds, armadillos, marsupials, monkeys, rabbits, bats, feral hogs, reptiles, fish, and crabs (Emmons 1987, Ludlow and Sunquist 1987, USFWS 1990).

The reproductive season is year round, with spring or autumn breeding peaks noted in Texas and Mexico. The mating season varies from region to region. In the Yucatan, mating occurs in October and October through January peaks are also reported from Paraguay and northeastern Argentina. Laack (1991) observed first reproduction in wild females between 30 and 45 months of age, but Eaton (1977) and Tewes and Schmidly (1987) estimated they can produce young at 18 to 30 months of age. Ocelots can produce young year round and have a gestation period of 70 to 80 days (Eaton 1977, Laack 1991). Litters contain 1, 2, and rarely 3 kittens (Eaton 1977, Laack 1991). Laack et al. (2005) reported an average of 1.2 kittens per litter for 16 litters born to 12 ocelots in Texas. Den sites are usually well hidden and include dense, thorny scrub, caves, hollows in trees or logs, and grass tussocks (Laack 1991, Tewes and Schmidly 1987). The mother provides extended parental care to the young because of the time it takes for them to become proficient at capturing prey.

Males are believed to contribute little to direct parental care (Tewes 1986, Laack 1991).

Adults of both sexes tend to have home ranges exclusive of other adult individuals of the same sex, but there is considerable home range overlap between the sexes (Emmons 1988, Laack 1991). Adult males have larger home ranges than adult females. The home ranges of subadult males and females tend to be similar in size to the home ranges of adult females until dispersal (Laack 1991). A number of studies have looked at the home range size of ocelots in Texas and Mexico, as determined from monitoring radio-collared individuals. Home range size generally varies from 2 to 18 km^2 (Caso 1994, Ludlow and Sunquist 1987, Konecny 1989, and Dillon 2005). The established adult home ranges of ocelots in Laack's study (1991) of dispersing ocelots did not include semi-isolated patches and transient home ranges were at times farther from the natal range than the animal's eventual home range.

In lowland rainforest, Emmons (1988) reported in the Manu National Park in Peru a home range of approximately 5.9 km^2 and 8.1 km^2 for males and 1.6 and 2.5 km^2 for females. In Cockscomb Basin Wildlife Sanctuary in Belize home range was reported as 31.2 km^2 for a male and 14.3 km^2 for a female (Konecny 1989). In seasonally flooded savanna woodland Ludlow and Sunquist (1987) reported a home range of 9.3 km^2 and 11.1 km^2 respectively for two males and 3.4 km^2 (average for six females in the Venezuelan llanos). In the Brazilian Pantanal home range for two adult females over six months was reported to be 0.8 and 1.5 km^2 (Crawshaw and Quigley 1989).

Ocelots live solitary lives except when a female is with kittens or when pairs come together briefly to breed. They disperse from the natal range at approximately 2 years of age. Young males always disperse from their natal areas, while young females might or might not leave their natal area. Laack (1991) reported on the dispersal of five male and four female subadult ocelots at Laguna Atascosa National Wildlife Refuge. One ocelot dispersed at 14 months of age, another at 20 months of age, and five at 30 to 35 months of age, but only four lived to establish home ranges. Seven to 9.5 months elapsed between the leaving the natal range and establishing an independent home range. One female moved 2.5 km (distance between home range centers) and the males moved 7 to 9 km. During dispersal the ocelots used narrow (5 to 100 m) corridors of brush along resacas and drainage ditches and small scrub patches within agricultural or pasture land. The ocelots tended to avoid areas occupied by adults. According to Laack (1991), none of the dispersing ocelots successfully joined a population outside of Laguna Atascosa National Wildlife Refuge.

Various studies resulted in the estimation of various survival rates. Tewes (1986) reported a survival rate of 71percent based on four mortalities while monitoring 12 radio-tagged ocelots and Haines et al. (2005b) estimated an annual survival rate at 87percent for resident adults and 57percent for transient ocelots. For newborn ocelots Laack et al. (2005) estimated 68percent annual survival rate.

2.1.5 Population Dynamics

Tewes and Miller (1987) suggested that several factors, including habitat islands saturated with resident ocelots, frustrated dispersal, and offspring that fail to leave parental home ranges, could indicate the possibility of inbreeding. The USFWS believes the fragmentation of habitat is likely reducing the ability of ocelots to interact freely, which will likely reduce the genetic viability of the species over time, and, because ocelots have to cross areas of little or no habitat to interact, could also be increasing the risk of harm to individual ocelots. Genetic studies to determine genetic differentiation were done on three populations, the Laguna Atascosa National Wildlife Refuge in Cameron County, the Willacy County population and Tamaulipas and Vera Cruz, Mexico, populations including three contiguous ranches; and northern Mexico including four private ranches in Tamaulipas and Vera Cruz, Mexico. Low variability was expected within the Texas populations because of range reduction and fragmentation. No inbreeding was detected among the three populations. The study showed the Willacy and Mexico populations were more closely related genetically than the Laguna Atascosa population was to either. Walker (1997) suggested that Laguna Atascosa and Willacy populations have lost genetic variation when they became isolated from ocelots in Mexico and from each other. Some habitat is managed for the ocelot, but in general the quality and quantity of Texas optimal ocelot habitat is on a downward trend and most likely supports a smaller population than that of the 1980s. The continued existence of the ocelot in its northern habitat is critical in stabilizing and reversing ocelot decline in Texas. However much of the area that could be restored to suitable habitat occurs on private lands. The Lower Rio Grande Valley is rapidly growing and agricultural lands are rapidly being developed (Wilkins et al. 2000). Opportunities for landowners to participate in economic incentive programs and Safe Harbor Agreements could enable the proactive conservation of the ocelot.

2.1.6 Reasons for Listing/Threats to Survival

Fragmentation of habitat and habitat loss due to brush clearing are primary reasons for ocelot decline. Ocelots rely upon thick vegetation along the Lower Rio Grande and the south Texas Tamaulipan brush community for foraging, resting, and establishing dens. They require corridors, such as rivers, shorelines, and natural drainages to travel between optimal habitat areas. Destruction and fragmentation of optimal habitat and travel corridors increases threats to the ocelot, such as incidental trapping, competition from feral dogs and cats, and mortality from vehicles. In Mexico, particularly in the northeast, ocelots suffer from habitat loss due to charcoal production, agriculture, and livestock ranching. Human population increases and associated urban expansion in Lower Rio Grande Valley have resulted in brush clearing and increased pollution (USFWS 1986). Industrialization has degraded water quality (USFWS 1986). Brushland habitats have also been converted to rangeland with herbicides (Bontrager et al. 1979), root plowing, and fire (Hanselka 1980).

Pesticides can be incorporated into the food chain and are potentially harmful or fatal to terrestrial and aquatic organisms. Agriculture pesticides are used year-round in Lower Rio Grande Valley, and drift and overspray from aerial applications occur periodically on National Wildlife Refuge lands. In the Lower Rio Grande Valley, runoff from cultivated fields could concentrate pesticides and herbicides in permanent bodies of water. Pesticide application rates have been extensive and heavy throughout the Lower Rio Grande Valley. As a result, pesticide accumulation in the biota remains a major concern in management of Tamaulipan brushland. Dichlorodiphenyldichloroethylene, polychlorinated biphenyls, and mercury have been detected in ocelot blood and hair samples at low concentrations but are not believed to be a problem at this time (Mora et al. 2000).

Although habitat loss in south Texas is mainly attributable to agricultural and urban expansion, other contributing factors include human modifications of the Rio Grande with dams and reservoirs for flood control and hydroelectric power; floodway systems that remove water from the stream channel during peak flows; water diversions for irrigation, municipal, and industrial usage; and channel restriction and canalization (CIMP 1995).

As a result of increasing economic integration between the United States and Mexico, there is increasing pressure for highways and bridge infrastructure and recently increasing national security concerns have increased the need for fences and lighting in the Texas/Mexico border region. There are nine existing and three proposed international bridges (Anzalduas, Donna, Brownsville Navigation District) along the Rio Grande between Falcon International Reservoir and the Gulf of Mexico**.** Local human population growth and rapid industrialization on the Mexican side of the border has raised USFWS concern regarding the placement of road and bridge infrastructure in the Lower Rio Grande Valley. Increased construction of these bridges could impact certain parcels of the Lower Rio Grande Valley National Wildlife Refuge, the Rio Grande floodplain, and the remaining riparian wildlife habitat and disrupt the continuity of the “wildlife corridor.”

Importing and exporting skins of many spotted cats became illegal in the United States between 1967 and 1973 and the ocelot was added to Appendix I of the CITES during 1989. Recommendations were made by Tewes and Everett (1986) for selective methods of predator control and the education of hunters to avoid accidental shooting of ocelots. In 1997 the USFWS entered into a Section 7 consultation with the U.S. Department of Agriculture’s Animal Damage Control for the use of leg-hold traps, snares, and M-44s explosive predator baits in south Texas and provided provisions for the protection of ocelots during their practices.

Data are limited regarding disease in the ocelot but several diseases and parasites have been documented. Some include Notoedric mange (*Notoedres cati*) (Pence et al. 1995), Hepatozoon in the blood, Cytauxzoon in their red blood cells, fleas (*Pulex sp.)*, dog ticks (*Dermacentor variabilis*), and Amblyomma ticks

(Mercer et al. 1988). The tapeworm (*Taenia taeniaeformis*) (USFWS 1990) and helminthes (Pence et al. 2003) were also reported in ocelots.

Ocelot mortality has also been attributed to aggression and predation by other animals. Ocelots can be prey of domestic dogs, coyotes, snakes, alligators, and bobcats (USFWS 1990).

Vehicular collisions are the greatest known cause of ocelot mortality in south Texas accounting for 45 percent of deaths of 80 radio-tagged ocelots monitored by Haines et al. (2005b) between 1983 and 2002. Underpasses and culverts have been or are to be installed for ocelots in critical areas to be used as travel corridors. The construction or modification of two roads that underwent formal Section 7 consultation, State Highway 48, and Farm-to-Market Road 106 made provisions for the careful placement, design, and maintenance of such culverts. It is anticipated these culverts and underpasses will allow ocelots to disperse between patches of suitable habitat and reduce genetic isolation of the populations.

2.2 GULF COAST JAGUARUNDI

The jaguarundi was listed as endangered on June 14, 1976 (41FR24064). The jaguarundi is also listed in the CITES Appendix I of the convention which bans international commerce. CITES offers some protection over much of its range. Hunting is prohibited in Argentina, Belize, Bolivia, Colombia, Costa Rica, French Guiana, Guatemala, Honduras, Mexico, Panama, Paraguay, Surinam, Uruguay, United States, and Venezuela. Hunting is regulated in Peru, while no legal protection is offered in Brazil, Nicaragua, Ecuador, El Salvador, and Guyana. No critical habitat is designated for this species.

2.2.1 Species Description

The jaguarundi has a long slender body, short legs, and sleek unpatterned fur, and looks more like a large weasel than a cat. They are roughly twice the size of a domestic cat, weighing about 7 to 22 lbs, standing 10 to 14 inches at the shoulder, and can be up to 4 feet long from nose to tail tip, with the tail taking up about a third of its length. It has a long and flat head instead of a round one. The ears are short and rounded, and it is one of the few cat species that does not have a contrasting color on the backs of the ears. Their eyes are small and set closely together.

Jaguarundi have two distinct color phases, red and gray, although the latter phase has also been called blue. The phases are so distinct that at one time they were thought to be separate species, the red one being called *Felis eyra*. A third color phase, black, has also been reported, but apparently does not occur in Texas (Goodwyn 1970). These cats are not known to be closely related to the other small South American cats. Instead of having 36 chromosomes, like the

South American cats, it has 38 like the cougar and puma (Tewes and Schmidly 1987).

2.2.2 Distribution and Abundance

The jaguarundi historically occurred in southeast Arizona, south Texas, Mexico, and Central and South America as far south as northern Argentina. Today this cat has a similar distribution, but in reduced numbers, although it probably no longer occurs in Arizona (Tewes and Schmidly 1987). It might also be extinct in Uruguay. They are reported to occur at Masaya National Park in Nicaragua, Soberania National Park in Panama, and El Imposible National Park in El Salvador (Nowell and Jackson 1996). The presence of jaguarundi in Florida is likely the result of human introduction (Nowak and Paradiso 1983).

In Texas, jaguarundi have been known to occur in Cameron and Willacy counties. Tewes and Everett (1986) analyzed the records of a clearinghouse established in 1981 to coordinate reception and filing of reports of jaguarundi (and ocelots) in Texas. Many of the reports were solicited by sending out questionnaires to trappers. Jaguarundi were reported from central Texas and the upper Gulf Coast as well as from south Texas. However, due to lack of any tangible evidence, such as road kills, most of the sightings in the first two areas are believed to have been of black feral house cats. Tewes and Everett (1986) could make no estimate of the jaguarundi population in south Texas, although its population is presumably smaller than that of the ocelot, because confirmed sightings are rare. Goodwyn (1970) reported from interviews he conducted in 1969 that jaguarundi were thought to occur in seven specific areas: Santa Ana National Wildlife Refuge, Laguna Atascosa National Wildlife Refuge "Paso Real," an area along the lower Arroyo Colorado on the border between Cameron and Willacy counties, the southern part of the El Sauz Ranch in northeastern Willacy County, a small area west of Olmito in southern Cameron County, an area east of Villa Nueva; and an area near the Port Isabel airport in Cameron County.

Tewes (1987) and Tewes and Everett (1986) documented several other credible reports of jaguarundi in Cameron, Willacy, and Webb counties. One was a road-killed male jaguarundi found near the junction of State Highway 4 and Farm-to-Market Road 511 (Keller's Corner) in Cameron County on April 21, 1986 (Tewes 1987, Laack and Rappole 1987). While this was the last confirmed record of a jaguarundi in Texas (Laack 2001), unconfirmed jaguarundi sightings in Hidalgo County include Bentsen Rio Grande State Park, Santa Ana National Wildlife Refuge, Lower Rio Grande Valley National Wildlife Refuge, Laguna Atascosa National Wildlife Refuge, Cimarron Country Club, Wimberley Ranch, and the Anacua Unit of the Texas Parks and Wildlife Department's Las Palomas Wildlife Management Area, and other areas (Prieto 1990, Tewes 1992, Benn 1997). Unconfirmed sightings of a jaguarundi occurred at the Sabal Palm Grove Sanctuary in Cameron County in 1988 (Anonymous 1989) and at the Santa Ana National Wildlife Refuge in March 1998. Based upon sighting reports, personnel of the Santa Ana National Wildlife Refuge suspect the presence of jaguarundi on the refuge (Benn 1997).

Unconfirmed sightings of jaguarundi near Eagle Pass, Maverick County, Texas have been documented in 1980, 1991, 1993, 1994, and the most recent in 2007. Various sightings have occurred in the vicinity of the Dos Republicas Coal Mine.

Counties where the jaguarundi has been documented include Cameron, Hidalgo, Webb, and Willacy counties. Suitable habitat for the jaguarundi, including dense thornscrub, riparian, live oak/mesquite forest, and dense herbaceous grassland/savannah, exists in other counties including Duval, Live Oak, McMullen, and Zapata (Paez 1994, Reyes 2007).

Sightings of jaguarundi have been recorded in or near Eagle Pass, Maverick County in 1980, 1991, 1993, and 1994. Most of the sightings were reported in the vicinity of a coal mine and Elm Creek. There are no recent confirmed reports. Population estimates are unknown at this time. No confirmed sightings of jaguarundi exist for the project area itself; jaguarundi currently in the study area might utilize tracts of brush habitat adjacent to the project area, and the giant reed along the Rio Grande as travel or dispersal corridors. Surveys were conducted November 5 and 6, 2007, for the Project (e^2M 2007). No jaguarundi were observed.

2.2.3 Habitat

Habitat requirements in Texas are similar to those for the ocelot: thick, dense thorny brushlands or chaparral. Approximately 1.6 percent of the land area in south Texas is this type of habitat (Tewes and Everett 1986). The thickets do not have to be continuous but might be interspersed with cleared areas. Jaguarundi possibly show a preference for habitat near streams (Goodwyn 1970, Davis and Schmidly 1994) and might be more tolerant of open areas than the ocelot.

The jaguarundi uses mature forest (i.e., brush) and pasture-grassland (Caso 1994). Jaguarundi habitat use was 53.0 percent mature forest and 47 percent pasture-grassland. Jaguarundi use open areas for hunting and sometimes resting, but if threatened with a potential danger they will seek cover in brush areas.

In South America, habitat includes high mountain forests, tropical forests, swamp forests, savannahs, overgrown pastures, and thickets (USFWS 1980, Tewes and Schmidly 1987). In Venezuela, it has been most frequently found to occur in drier tropical forest relative to other habitat types. They are rarer and thinly distributed in moist forest types, especially deep rainforest. They have been reported to prefer forest edges and secondary brush communities, but this is where they are most frequently seen. In Belize's Cockscomb Basin Wildlife Sanctuary, jaguarundi are most frequently associated with water and old-field habitats. It appears to be the most flexible cat in its ability to occupy different habitats and having access to dense ground vegetation appears to determine habitat suitability (Nowell and Jackson 1996).

The most common plants occurring in habitats in the Lower Rio Grande Valley where the jaguarundi is known to occur are huisache (*Acacia farnesiana*), blackbrush acacia (*Acacia rigidula*), prairie baccharis (*Baccharis texana*), chilipiquin (*Capsicum annuum*), lotebush, allthorn goatbush (*Castela texana*), Texas persimmon (*Diospyros texana*), coyotillo (*Karwinskia humboldtiana*), common lantana (*Lantana horrida*), berlandier wolfberry (*Lycium berlandier*), javelinabrush (*Microrhammus ericoides*), Texas prickly pear (*Opuntia lindheimeri*), retama (*Parkinsonia aculeata*), honey mesquite (*Prospis glandulosa*), cedar elm (*Ulmus crassifolia*), and lime pricklyash (*Zanthoxylum fagara*) (Goodwyn 1970).

2.2.4 Life History

Most information gathered on the jaguarundi comes from historical writings and information gained from studying the ocelot in south Texas and in Mexico.

In Belize, jaguarundi are seen quite often and Konecny (1989) found that two males had home ranges of 100 and 88 km^2, and one female had a home range of 20 $km^{2.}$ Caso (1994) captured and radio-collared jaguarundi in Tamaulipas, Mexico, from 1991 to 2005. He found home range sizes averaged 9.83 km^2 and 8.36 km^2 for males and females, respectively. Both studies captured jaguarundi in undisturbed brush and grasslands with scattered second growth woodlands (Caso 1994). Historical accounts from Mexico suggest that jaguarundi are good swimmers and enter the water freely.

Little is known of jaguarundi reproduction in the wild. Den sites include dense thickets, hollow trees, spaces under fallen logs overgrown with vegetation, and ditches overgrown with shrubs (Tewes and Schmidly 1987, Davis and Schmidly 1994). In Mexico, they are observed as being solitary, except during November and December when they mate. Young have been born in March and August with possibly two litters per year. Usually two to four young compose a litter, with litters being either all of one color phase or containing both the red and gray phases. Jaguarundi kittens are spotted at birth, and lose their markings as they mature. Gestation (for captive jaguarundi) varies from 63 to 75 days (Goodwyn 1970, Tewes and Schmidly 1987, Davis and Schmidly 1994). Jaguarundi communicate by calls, of which 13 have been identified in captive animals. The largest repertoire occurs during the mating season (Hulley 1976).

The jaguarundi is primarily diurnal, although some nocturnal activity has been recorded (Konecny 1989, Caso 1994). However, it appears to be less nocturnal than the ocelot. They are excellent climbers although they spend most of the time on the ground. They hunt primarily in the morning and evenings. Prey is largely birds, but bird eggs, rats, mice, rabbits, reptiles, and fish are also taken (Goodwyn 1970, Tewes and Schmidly 1987, Davis and Schmidly 1994). In

Venezuela, Bisbal (1986) found the diet of jaguarundi to be 46 percent mammals, 26 percent birds, and 29 percent reptiles.

2.2.5 Population Dynamics

Habitat loss and alteration due to brush-clearing activities, human encroachment, and human persecution are the main cause for the decline in jaguarundi populations (USFWS 1995). Tracts of at least 100 or 75 acres of isolated dense brush, brush interconnected with other habitat tracts by brush corridors, or smaller tracts adjacent to larger areas of habitat might be used by jaguarundi. Roads, narrow water bodies, and rights-of-way are not considered barriers to movements. Brush strips connecting areas of habitat, such as brushy fence lines and water courses, are very important in providing escape and protective cover.

The jaguarundi is generally not exploited for commercial trade and does not experience the harvest pressure the ocelot does (Sunquist and Sunquist 2002). In Central America, South America, Texas, and Northeastern Mexico, the coat of the jaguarundi is not highly sought after by the skin trade because of its poor quality and lack of spotting. They are difficult to trap but can be caught in traps set for commercially valuable species and can be subject to low intensity hunting pressure around settled areas.

2.2.6 Reasons for Listing/Threats to Survival

Loss of habitat is one of the main threats to the jaguarundi. Historically, dense mixed brush occurred along dry washes, arroyos, resacas, and the floodplains of the Rio Grande. A majority of shrub land has been converted to agriculture and urban development. Unfortunately for the jaguarundi, the best soil types used for agricultural crops also grow the thickest brush and thus produce the best habitat for the jaguarundi. Less than 5 percent of the original vegetation remains in the Rio Grande Valley.

3. ACTION AREA

The project area borders the Rio Grande and is composed of a riparian community and urban developed vegetation. The riparian community found in the project area is dominated by giant reed along the banks and undeveloped natural floodplains of the Rio Grande. Giant reed, a native of eastern Asia was introduced as an erosion-control agent along rivers and ditches and has become highly invasive, colonizing vast areas of riparian zones and replacing native vegetation along the Rio Grande and its tributaries. Urban areas occur within the project area continuing east into the City of Eagle Pass.

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4. EFFECTS OF THE ACTION

4.1 OCELOT AND JAGUARUNDI

4.1.1 Primary Pedestrian Fence

Direct Effects

Approximately 4.47 acres will be directly impacted from the installation of the primary pedestrian fence in Section M-2A. Vegetation types (and acreages) that would be affected include approximately 0.76 acres of herbaceous grassland (includes 0.23 acres of Bermuda grass herbaceous vegetation, 0.001 acres of Russian thistles herbaceous vegetation, and 0.53 acres of giant reed shrubland/herbaceous vegetation), 0.26 acres of honey mesquite woodland/shrubland, and 1.19 acres of sugarberry honey mesquite woodland, for a total of 2.21 acres of vegetation impacted. The remainder of the impacted area is currently composed of existing roads and trails. The removal of vegetation and the presence of the fence will result in some fragmentation of ocelot and jaguarundi habitat. Fragmentation results from the conversion and development of larger, more productive habitat areas, leaving smaller, isolated patches of habitat. The Project will reduce the size of the habitat currently present; however, the riparian giant reed between the patrol road and the river will not be removed, reducing the fragmentation impact.

Human activity and elevated noise levels during the construction period could also hinder movement of the ocelot and jaguarundi between Mexico and the United States in the project area.

Indirect Effects

Little vegetation removal will be required for the installation of the primary pedestrian fence because much of this fence borders residential areas. It will decrease the number of river access points for dogs and humans. Dogs could harass the ocelots; the fencing could potentially decrease such harassment. The height of the primary pedestrian fence and its impermeability to humans will also restrict cat movement. Cats could continue to travel through a vegetated corridor to the ends of the primary pedestrian fence, although the extent to which they will do so is unknown. The impact of additional travel to the ends of the fence is also unknown. The additional travel time could result in a reduction in contact with humans; however, the additional energy expenditure could also result in the risk of encountering humans or vehicular strikes.

Construction and operation of tactical infrastructure will increase border security in the Del Rio Sector and may result in a change to illegal traffic patterns. However, changes to cross-border violator traffic patterns result from a variety of factors in addition to border patrol operations; and therefore, are considered unpredictable and beyond the scope of this BRP.

4.1.2 Patrol Roads

Direct Effects

The area currently contains approximately 0.8 miles of unimproved roads. The Project will include road improvements. Although roads fragment ocelot and jaguarundi home ranges and travel corridors, no new roads associated with the Project will be built. An increase in road usage in Section M2-A during construction would result in a temporary increase in the risk of a vehicular strike because this area is a potential travel corridor.

4.1.3 Lights

Direct Effects

Ocelots are largely nocturnal and stay in brush habitat. Light illumination will cause both ocelots and jaguarundi to avoid these areas, although to a lesser extent for jaguarundi. The cats will also more likely avoid areas with heavy human activity. In more rural areas, lights will be expected to have more significant impacts. Noise from portable light generators, if needed, or permanent illumination of suitable brush habitat will cause the cats to seek other travel corridors, increasing the risk of injury from vehicle strikes. Unnatural nighttime lighting could prevent use of habitat otherwise suitable for resting or breeding and can expose adults and young to increased risk of predation. However, BMPs will be implemented to avoid lighting ocelot and jaguarundi habitat at levels of more than 1.5 foot candles.

Indirect Effects

Depending upon the degree of success of the lighting project, more lights can be added in the future. If more light is installed in the future, the potential impact on nocturnal species, including ocelots or jaguarundis in the area, will be increased. It is assumed such actions, and their impacts on ocelots and jaguarundis, will be addressed in future coordination with USFWS.

The placement, angle, and direction of the lights will avoid illuminating the adjacent riparian vegetation. If the lighting does not achieve the desired CBP goals, the number can be reduced in favor of other options. These minimization efforts will allow ocelots and jaguarundis to use the darker, riparian areas they prefer.

4.1.4 Cumulative Effects

The primary cumulative effect from future projects will be the permanent loss of vegetation. The rapid economic expansion of cities in south Texas with the influx of immigrants, retirees, and increased tourism will continue to result in the loss of brushland, and therefore, ocelot and jaguarundi habitat.

Additionally, it is possible that additional road improvements will be proposed in the future. An increase in roads will lead to more vehicular traffic and more movement along the U.S./Mexico international border. Increased vehicular traffic will lead to an increase in the amount of dust, caliche or otherwise, being deposited on nearby vegetation, which will temporarily reduce the plants ability to photosynthesize until the dust is washed off, for example, by rainfall. Road expansions will increase loss and fragmentation of habitat corridors and increased road mortality. Encroachment from urban development and border settlements that bring increased noise, light, fencing, and human disturbance will also result in the loss of habitat and avoidance of areas or corridors by the endangered ocelot and jaguarundi.

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5. DETERMINATION OF EFFECT

Table 5-1 summarizes the federally listed species and habitats that are known to occur within 25 miles of the U.S./Mexico international border in Val Verde County.

Table 5-1. Determination of Effects on Federally Listed Species in Val Verde County

Species	Listing Status	Determination
Brown pelican, *Pelecanus occidentalis*	Endangered	No effect
Black-capped vireo, *Vireo atricapilla*	Endangered	No effect
Least tern, *Sterna antillarum*	Endangered	No effect
Texas snowbells, *Styrax texana*	Endangered	No effect
Tobusch fishhook cactus, *Ancistrocactus tobuschii*	Endangered	No effect
Devils River minnow, *Dionda diabolic*	Threatened	No effect

Based upon the information provided regarding the implementation of the Project in specific sections, no effects are anticipated for brown pelican, black-capped vireo, least tern, Texas snowbells, Tobusch fishhook cactus, or Devil's River minnow in Val Verde County.

Table 5-2 summarizes the federally listed species and habitats that are known to occur within 25 miles of the U.S./Mexico international border in Maverick County.

Table 5-2. Determination of Effects on Federally Listed Species in Maverick County

Species	Listing Status	Determination
Ocelot, *Leopardus pardalis*	Endangered	Not likely to adverse affect
Gulf Coast jaguarundi, *Herpailurus yagouaroundi cacomitli*	Endangered	Not likely to adverse affect

The ocelot and Gulf Coast jaguarundi might be, but are not likely to be, adversely affected by the Project. The primary pedestrian fence will be located adjacent to urban areas and outside of the potential cat migration areas. Lighting will not illuminate the riparian corridor and therefore will not disrupt potential cat migration activities. The Project will remove approximately 2.21 acres of vegetation. However, giant reed that parallels the Rio Grande that could potentially be used as cat migration corridor will not be removed. This vegetation does not provide high-quality habitat for foraging, is present in a very narrow corridor along the Rio Grande, and is adjacent to developed areas. Due to the lack of documented sightings for these species in Maverick County, the location of the primary pedestrian fence and lights outside potential cat migration areas, the limited amount of vegetation that will be removed, and implementation of a revegetation plan, these impacts might affect, but are not likely to adversely affect, the Gulf Coast jaguarundi or ocelot.

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